HALLUCINOGENS

"Hallucinogens," pp. 44-132 from William Emboden's book *Narcotic Plants* (New York, 1979). This material is presented solely for non-commercial educational/research purposes.

"We are such stuff as dreams are made on; and our little life is rounded with a sleep."

William Shakespeare, The Tempest
Act IV, Scene 1

OF THE FIVE CLASSES OF DRUGS defined in 1924 by Lewis Lewin, hallucinogens (psychotomimetics) fall into the intriguing category *phantastica.* The plants in this group are those that act upon the central nervous system to produce a state in which there is an alteration of time, consciousness of self, space, and perception of the physical world. Sensory displacement may accompany a voyage into the realms of the fantastic and there may be acute sensitivity to color and hearing. Sometimes these sensations are divided into the categories of auditory, visual, and tactile hallucinations, but synesthesia may accompany this experience and one sensation is altered or displaced by another, or the senses become temporarily interchanged. A perfume becomes red and the sound of a bell in the distance is a vivid blue. The touch of a piece of silk may produce the sensation of a color comingled with a fragrance and a most unusual perception of time and place. Polymelia, the sensation of having many limbs or digits, is not unusual in extreme hallucinations. Past events may be re-created with an alarming range of detail, and it is possible to transcend the physical and mundane, even leaving the corporeal body for a period of soul flight, spirit flight, levitation, or what has been called astral projection. The world of phantastica is a world in which all things are possible. It is no wonder that the opulence of late-nineteenth-century French writers such as Theophile Gautier and Baudelaire has imbued prose and poetry with a peculiar lustre that is ultimately tied to the world of hallucinogenic plants.

There is an ever-continuing vocabulary that attempts to define the elusive states characterizing hallucinations; none seems quite satisfactory. We know that certain plants produce a restricted syndrome of hallucinations such as visual or audio, while others seem to display their capacities in a pyrotechnic fashion in which one state merges mercurially into another. By 1932 the French neurobiologist Raoul Mourgue had analyzed over 7,000 publications on hallucinations in *The Neurobiology of the Hallucination,* and he concluded that all of the data analyzed from these sources could not provide him with a theory of hallucinations. Neurobiologists continue to probe the poorly understood world of the mechanisms

of psychotomimetic plant drugs in an attempt to understand their mode of functioning. The ethnobotanist, on the other hand, seeks to identify the plants capable of producing such profound altered states of consciousness and put them into some meaningful historical context. The ritual use of hallucinations has been the subject of several symposia volumes in the last decade in which an attempt has been made to identify the plant hallucinogens with the myths, rites, and magic that have given them the position of providing shamanic equilibrium, in a psycho-social sense, in diverse cultures. Thus, our understanding is being broadened by a collaboration between chemists, botanists, anthropologists, psychologists, and sociologists. After all, it is a task of the investigator in this realm to attempt to separate the learned psychodrama of a culture from the behavior produced by a plant drug. One of the great collaborations of this century is that of Dr. Richard Evans Schultes of the Harvard Botanical Museum and Dr. Albert Hofmann of the Sandoz Laboratories in Basel, Switzerland. Together these two scientists in 1973 produced the first book to effectively survey *The Botany and Chemistry of Hallucinogens.* It is collaborations such as these that are going to produce a new understanding of a complex subject that has been much misinterpreted.

Geneticists and physiologists are coming closer to an understanding of some of the aspects of the mass of neural circuits called "mind." As with every other function of man, the mind is under chemical control, and there is a chemical basis for the ardor and passion of lust, the subtle sympathies of love, the rage of tyrants, and for "sleep that knits up the ravelled sleeve of care." The use of hallucinogens in an attempt to "expand consciousness" and to probe subconscious states of mind seems an inevitability. A general lack of information has led to an assumption on the part of the public in general that this is the first generation that has had to cope with the complexities of pursuing altered states of consciousness. It is the hope of this author that a historical overview of hallucinogens in world cultures will provide the sort of understanding that may lead to further inquiry rather than judgements. For the moment our lack of precise information on the long-term effects of these psychotomimetics would suggest caution.

It was simpler even a decade ago to state the number of hallucinogens in the Old World versus the New World, but abundant interest in the area of ethnobotany is constantly revealing to us new species of plants in both of these areas that have been used to induce hallucinations. Although it is a consensus that the New World provides substantially more hallucinogens than the Old World, recent investigations into the defunct civilizations in areas such as ancient Assyria, Egypt, and Greece are providing interesting clues into the provoked experience in these ancient civilizations. "The Mysteries" that were those of Eleusis and of temple priests in Babylonia, Mesopotamia, Assyria, and Egypt may be more than the mere ritual and verse that has been invoked by archeologists and anthropologists.

Of the more than 600,000 plant species known to man, about one in ten thousand of those analyzed chemically has revealed a principle that would qualify it as a hallucinogenic plant, but the search goes on. We also are confronted with the dilemma of why certain plants have been historically selected as agents for inducing hallucinations while other plants available to that same culture have been ignored,

even though they may have the same potential, and in some instances may have fewer associated toxins.

It is an important observation that unlike the other categories discussed in this book, the true hallucinogens are non-addicting. They may produce the aforementioned disordering of the senses and create a disruption of the ego, but they do not create physiological habituation. I cannot see it as a process without possible hazards, for in probing into the recesses of the mind, in reshaping modes of thought, in repressing the ego and extending experience into undreamed of realms, the individual who is unprepared psychologically may experience a crisis of considerable dimensions. And yet, by contrast, some of these plant drugs have been the most useful adjuncts to therapy in recalcitrant patients who could not otherwise yield to the experiences of psychic extension. In antiquity the shaman was the guide for spirit flight and in some areas of the world he still is. In contemporaneous Western society the physician and the psychotherapist must serve as shaman-guide.

Dr. Alexander Shulgin stated in a symposium on psychotomimetic drugs that sanity is a statistical thing determined by a group of three; it is a minority concept. I find this concept intriguing, for it eliminates "the real world" and relates reality to a society, a time and a place in that society, and a judgement from the majority. Anyone who has used a potent hallucinogen knows that reality becomes a very subjective thing. The paradox is that the intensity of this reality may far exceed the non-provoked reality, or what some might define as a "normal state of being." Perhaps the use of a hallucinogen is a part of the normal, and is a part of being human. Psychotropic means literally to turn the soul or mind, to change the psyche. Is this not a normal human function, and if induced, is it abnormal? Are we not, as Shakespeare tells us, "such stuff as dreams are made on"? Can man endure an unchanging realm of conscious behavior without respite? History would seem to say no.

There is only limited authoritative information on the mode of action of those principles that have been identified as hallucinogenic. In some instances it is thought that the active principle forms a secondary compound in the liver by combining with a protein, in others a hallucinogen is activated by being ammoniated or methylated in the body and exists only as a hallucinogenic precursor before that. In other cases the psychotomimetic is thought to interfere with normal oxidative processes in the brain. Recent efforts indicate the accumulation of materials such as serotonin, normally broken down by the transmission of nerve impulses, that act as a hallucinogenic agent. Some chemicals in this group would seem to break neural synapses or render transmission across them an impossibility. All of these processes are probably extant in different systems, for the chemicals that facilitate such physiological and psychological responses are as diverse as the plants producing them.

In order to systematize the survey of the many hallucinogenic plants of the world, I have thought it best to order them geographically, as an alternative to a chemical ordering or a botanical arrangement would presume too much on the part of the reader. I also believe that this arrangement may be more historically meaningful.

TROPICAL ASIA

A frequent misconception regarding early explorations is that their purpose was to provide spices for European tables; in reality, this trade sought sandalwood, pepper, opium, rhubarb, and aloes not for gourmand palates, but as narcotics, aphrodisiacs, and, most important, medicines. From the ninth to the fifteenth centuries, Venice controlled the trade, having defeated her Genoese competitors. With the fall of Constantinople in 1453, the Portuguese entered the trade and monopolized markets for the next century; during this period the Spaniards sponsored Columbus, who, looking for a trade route to India, stumbled upon America. When in the seventeenth century the Dutch held supremacy of the seas, they initiated ruthless tactics to gain a monopoly of the drug trade. Islands not under Dutch control were plundered for their spices and drug plants, and the few remaining plants were destroyed so that subsequent invaders might not have access to them.

For sixteen years the Dutch entrepreneurs controlled the entire market of nutmeg from Amsterdam. This was a very precious commodity, its seeds being regarded as a medicine of enormous merit. So precious were nutmegs that carved wooden replicas were sold to the ignorant via a black market. Slaves on the ships bringing nutmeg to Europe were castigated for consuming part of the cargo. They knew that a few of the large kernels of the nutmeg seed would relieve their weariness and bring euphoric sensations of an other-worldly nature accompanied by pleasant visions. Nausea and dizziness often followed as the price for this respite from reality, whether the nut was grated and eaten or made into a snuff. The more practical mind of the European saw this seed as a potential medicine and did not hesitate to administer it in the event of severe illness. On that day in February 1685 when the feeble King Charles II was felled by a clot or hemorrhage, one of the numerous unsuccessful attempts to revive him included a decoction of nutmeg. His death a few days later did nothing to detract from the reputation of nutmeg as a very useful drug. Nutmegs encased in silver were worn at night as an inducement to sleep. Aphrodisiacal properties were ascribed to them, and they became a standard element in love potions. In London the rumor spread that a few nuts would act as an abortifacient. A miraculous plant indeed! The ladies who procured abortions were called "nutmeg ladies."

Myristica fragrans is the Latin name for the nutmeg tree, which attains a height of sixty feet and has small, heavy-scented yellow flowers (Pl.17). These dioecious trees are native to the Banda Islands, which were formerly known by the name Nutmeg Islands. It was not until 1512 when the Portuguese reached Banda that nutmeg became known to the Western world. At maturity a pendulous fruit resembling an apricot splits to reveal a dark brown seed about an inch long and covered by a crimson arillus fingering around the seed. The arillus is easily separated from the seed and is known in the spice trade as mace, a delicate condiment. Whole nutmegs minus the seed coats contain fifteen per cent volatile oils; these impart its characteristic flavors.

Hallucinogenic effects from nutmeg were not recorded until 1576, when Lobelius in his *Plantarum seu Stiripium Historia* described a "pregnant English lady who, having eaten ten or twelve nutmegs, became deliriously inebriated." She had undoubtedly heard rumors about the efficacy of nutmeg as an abortifacient: it was fortunate that she did not die from the experience, for a large dose of nutmeg may be lethal. In 1829 the famous biologist Purkinje ate three nutmegs and compared his experience to that of *Cannabis* intoxication (it is interesting to note that this famous biologist was obviously familiar with the effects of *Cannabis* euphoria). Drowsiness seems to accompany the delirium, which may last up to thirty-six hours.

Some doubt has been expressed that nutmeg has ever been a culturally important hallucinogen, but a *Materia Medica* published in Bombay in 1883 indicates that "the Hindus of West India take *Myristica* as an intoxicant." Further evidence derives from an Ayurvedic name for nutmeg, *made shaunda*, which translates as "narcotic fruit." It is well known that nutmeg is mixed with betel nut and snuff in certain parts of southern India. Restrictions against the consumption of hashish in Egypt are reported to have led to the substitution of nutmeg, according to a recent book on poisons. My own observations in Alexandria and Cairo would indicate to me that there is a ready supply of hashish in the streets, and no nutmeg substitution would be necessary. In rural eastern Indonesia, powdered nutmeg is used as a snuff. None of these reports suggests any ritual or religious use for nutmeg. It would seem only a temporal escape. Perhaps the most common use of nutmeg is to be encountered in prisons where other drugs may not be readily available. Some prisons have now dropped nutmeg from their list of kitchen condiments. In most instances it seems to be adopted where the drug of preference is unattainable. The usual side effects include headache, nausea, vertigo, tachycardia, and constipation, making it a less desirable drug than many others.

The response to nutmeg intoxication is extremely diverse. Some individuals experience a profound distortion of time and space and actually have visual hallucinations. These are not so predictable as with hashish, mescaline or LSD. Auditory and tactile hallucinations are not uncommon. Some reports indicate that the participant felt nothing, including the undesirable effects. Perhaps a part of this is predicated on the amount used and the freshness of the material. It is known that nutmeg deprived of its oil fraction has no effects, and nutmeg as purchased in containers in a powdered form is often old and the oils have volatilized or oxidized. Freshly grated nutmeg produces the most profound intoxication. It is the aromatic ethers that seem to be the most likely source of hallucinations. These may be derived from either *Myristica fragrans* or *M. malabarica.*

The mode of action of these aromatic ethers remains obscure. Myristicin constitutes four per cent of the oil of the nut, and twenty-five per cent of this fraction is elemicin, which can be degraded to two potent hallucinogens, TMA (trimethoxy amphetamine) and MMDA (3-methoxy-4, 5-methylenodioxy amphetamine) merely by becoming ammoniated in the body. Crude nutmeg and myristicine (a synthetic) have both been shown to produce a degree of monoamine oxidase

inhibition in both in vivo and in vitro testing. Since separate fractions of these aromatic ethers have been tested in human subjects and have shown less effect than a combination of two or more, a synergistic activity has been proposed. In laboratory animals large doses of nutmeg have revealed diseased livers upon autopsy.

In vitro studies have demonstrated the conversion of oil of nutmeg to amphetamines, but as yet it has not been shown to occur in vivo. While the elemicin and myristicin fractions seem the most likely candidates as "pro-hallucinogens," it may be that these two act with another fraction of the oil, perhaps safrol. Safrol is the predominant fraction in the oil of saffron taken from the female parts of *Crocus sativa.* Saffron was used not only as a condiment and a dye, but was regarded as a medicinal narcotic in the ancient Mediterranean and was used in the form of a tea to put unruly children to sleep. If the safrol fraction undergoes demethoxylation, it produces the well-known narcotic MDA (methylenodioxy amphetamine). It has led some chemists to characterize these fractions of nutmeg as the naturally occurring amphetamines, although they are only precursors.

In southeast Asia, especially in cosmopolitan cities such as Bangkok, Thailand, there is a plant product sold as a substitute for opium under the names *mambog* and *kratom.* The plant, *Mitragyna speciosa,* is a member of the coffee family, Rubiaceae. It has a shrubby form, with dichotomous branches terminating in yellow balls of flowers (Pl. 18). *Kratom* is a leafy material that may be smoked like *Cannabis,* and *mambog* is a thick syrup made from the leaves. It is difficult to estimate the antiquity of *kratom* use in tropical Asia, but we do have a report from the year 1895 indicating that the leaves were being sold in the "Straits Settlements" (Malaya) as an opium substitute and as a withdrawal agent. Leaves are either chewed when freshly picked, smoked when dried, or go into the production of *mambog.*

The chemical that acts on both the central nervous system and the sympathetic divisions of the autonomic system has recently been identified as the indole mitragynine. Effects of *kratom* are a pleasant reverie comparable to altered states of consciousness achieved by using hallucinogenic mushrooms such as *Psilocybe* or a small dose of LSD. The chemical skeleton of this organic compound is very similar to the latter. Evidence to date does not indicate that *kratom* is addictive, but it is habit forming. Extended use of *Mitragyna* derivatives results in emaciation, a distended stomach, pallor, darkened lips, dry skin, numbness in peripheral areas, twitching, and anomalous cardiac disorders. Although the primary action on the central nervous system is attributed to mitragynine, which increases the excitability of the medullary portions of the brain, the following eight alkaloids have been isolated may contribute to the characteristic syndrome: ajmalicine, corynanthedidine, isomitraphylline, mitraphylline, paynantheine, speciophylline, speciofoline, and speciogynine. The *trans* configuration of mitragynine is of especial interest in that this form of mitragynine is analogous to other psychoactive compounds, such as psilocybin and psilocin from *Psilocybe* mushrooms and lysergic acid amide found in ergot and baby wood rose. In its ability to excite the motor centers of the central nervous system, the preparations of *kratom* and *mambog* suggest cocaine-like functioning. Clearly, this is one of the most complex of the hallucinogens.

TEMPERATE ASIA

In 1972 James H. Sanford of the Department of Religion, University of North Carolina, presented a fascinating account of Japan's "laughing mushrooms" and linked these to some equally curious mushrooms and behavior associated with their consumption in China. His interest began with the reading of a tale of a collection of medieval Japanese folktales. These eleventh-century tales, characterized as folk history, present in Volume Five a story of woodcutters from Kyoto who lost their way in a mountainous region. They encountered in the wilderness a group of four or five Buddhist nuns who were dancing and singing and perceived them to be demons because of their erratic behavior. Upon questioning the women, they were told that these were indeed nuns who had also strayed and, becoming hungry, had roasted and eaten some mushrooms, whereupon they began to laugh and dance about. The woodcutters were both astonished and hungry. The nuns readily shared their mushrooms, and all became giddy, laughing and dancing about together. The mushrooms were called from that time on *maitake* or "dancing mushrooms."

This tale led to Sanford's investigation of possible subsequent accounts of such unusual behavior and the mushrooms causing it. Among other things, he was able to conclude that the tale dated to about A.D. 1000, and the mushrooms were either *Paneolus papilionaceus* or *Pholiota spectabilis* (Figs. 28 & 29). To these he adds the identifications of Imazeki and Hongo, who speak of *waraitake* (the laughing mushrooms) as *Paneolus papilionaceus* and another form of dancing mushroom as *Gymnopilus (Pholiota) spectabilis.* These authors also mention a false "dancing mushroom," *Psilocybe (Stropharia) venenata* or *P. (S.) caerulescens,* since all intoxicate in a similar manner. *Paneolus papilionaceus* was a mushroom identified by Heim as the ingredient being used by witches in Portugal. Furthermore, the same species has been used in the United States for some time for deliberate intoxication; a sort of cheap drunkenness.

Sanford did not terminate his research with the Japanese tale, but read a Chinese work of the Sung period by Yeh Mengte (1077–1148) in which he found a cure for the uncontrollable fits of laughter caused by eating the maple-tree fungus. The cure was eating muddy earth, but more interesting is a Chinese hallucinogen associated with the maple tree and with the sort of laughter reported in the Japanese tale. The Chinese tale was set in the valleys about Mount Ssu-ming in southwestern Cekiang Province, an area closely associated with the T'ien T'ai sect of Buddhism. The mushroom goes unidentified except for its characterization of *chün.* Sanford also located a source for the "laughing fungus" in a work of 1619, which translates as *The Five Fold Miscellany.* This and other later sources seem to add little to the possibility of a deliberate and contextual use of the fungus in either Japan or China. Perhaps this is the lead into an investigation that might provide a relationship between the mushroom and instances of some ritual intoxication.

Cannabis is one of the most ancient hallucinogens of mankind, having been employed by the Chinese over eight thousand years ago (Pls. 19, 20, & 21). Today it enjoys the widest distribution of any of the psychotomimetics and perhaps the

FIG. 28:
Paneolus papilionaceus

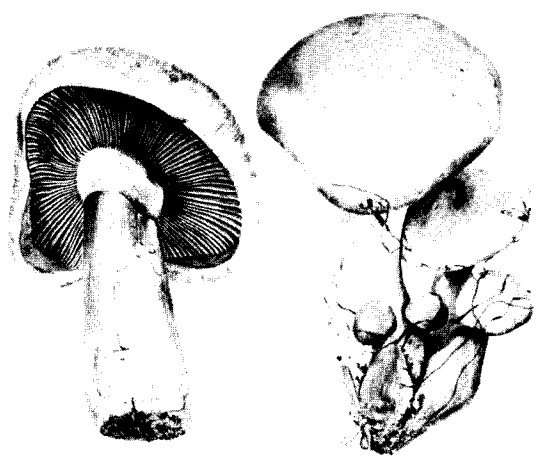


FIG. 29:
Pholiota spectabilis

FIG. 30: Scythian *Cannabis* vessels and stakes for vapor tent

widest acceptance in a social, if not legal sense. The ancient Scythians and Assyrians used it to produce an intoxicating smoke that was not burnt in a cigarette, but in a vessel under an animal skin where the intoxicating resins could volatilize and be inhaled (Fig. 30). We have evidence from early Scythian sites as well as the testimony of the historian Herodotus, who referred to the funeral ceremonies of the "howling Scythians." These people built fires and heaped the smouldering coals with *Cannabis* plants which were covered by a sheepskin quilt. Participants would lift the skins and inhale the fumes. The Sanskrit *Zend-Avesta* first mentions this material in 600 B.C. In India the use is as old as soma. Under the name *bhang*, it was one of five sacred plants employed in magical rites to permit freedom from distress and protection from enemies. It was consumed as an intoxicating drink in both

Thrace and India. Galen speaks of "a warm and toxic vapor" produced by eating the seedcakes of *Cannabis*. In the year A.D. 220 we have records of the celebrated Chinese physician and surgeon Hua-T'o performing surgery with *Cannabis* resin in wine.

Hashish, or hasheesh, is the resin obtained from the glandular leaves and floral parts of the female *Cannabis* plant. The term has been derived from the name of a Persian from Hashishin Tus. Al-Hasan ibn-al-Sabbah (A.D. 1124) was tutored in the Batinite tradition and was expected to become a missionary for the sect of Ismailites. A strongly charismatic figure, he drew dissenters from orthodox Moslem thought to his sect of "the New Word" or the Hashishins, from whence we derive the term assassin. It would not be necessary to pursue this history if it were not for the popular belief that Al-Hasan had his followers perform ugly deeds under a *Cannabis* madness. His movement was essentially religiously motivated, and his followers were no more murderous than equally zealous Christians in support of their faith of the new word. Most of the information that we have about Hashishin and his religion comes from descendents of the Mongolian Hulagu, who in 1256 seized the mountain fortress of this cult as well as their fortresses and palaces in Persia and destroyed all books and records of this sect. We do know that this sect was responsible for the founding of hospitals, observatories, and universities. Unfortunately, the name of Hashishin will probably remain associated with murders and *Cannabis*, while his noble deeds are already forgotten.

The word marijuana (marihuana) is derived from the Portuguese *maran guango* and connotes intoxication. Marijuana is perhaps the most popular term for *Cannabis* in the English-speaking world, although synonyms of popular origin in current use now number well over twenty. Sara Bentowa, of the Institute of Anthropological Sciences in Warsaw, has studied the philology and etymology of *Cannabis* from ancient times and compiled over one hundred synonyms for the plant prior to 1936.

There has been considerable controversy over the question of species in the genus, just as botanists of an earlier time debated over the disposition of *Cannabis* into the proper family. While it is now accepted that *Cannabis* is in the family Cannabaceae, it is the contention of a few botanists that there is but a single species in this cosmopolitan genus, that being *C. sativa*. Most taxonomists who have studied the genus recognize at least three species: *C. sativa*, the tall (6–25 feet) plant of northern areas used predominantly for the fiber in its stem; *C. indica*, a low-growing bush of a more southern latitude and high in intoxicating resins; and *C. ruderalis*, a small unbranched invader of other crops in northeastern Europe. This polytypic concept of the genus originated in the eighteenth century with the famous biologist Lamarck and was extended by the Russian botanist Janishevsky in 1924.

The issues surrounding the use and abuse of *Cannabis* are so complex that perhaps the only way in which they might be understood is in terms of historical uses in different areas of the world. In ancient China it was predominantly a medicant for gout, female disorders, rheumatism, malaria, beriberi, constipation, and absentmindedness. As already indicated, it found a place as an anesthesia. Greece had a word for smoking this plant, *cannabeizein*. This often took the form of

volatilizing it by placing the resinous top in an incense burner in which myrrh, balsam, and frankincense had been mixed, this in the manner of the shamanic Ashera priestesses of the pre-Reformation temples in Jerusalem, who anointed their skins with the mixture as well. This is possibly the material of the priestess at Delphi.

Democritus (ca. 460 B.C.) knew the plant as *potamaugis,* which was drunk in wine with myrrh to produce delirium and visionary states. Democritus wrote of the immoderate laughter that followed a draught of this decoction. It is of interest to note that Democritus was called "the laughing philosopher." Theophrastus (371–287 B.C.) gave one of the first botanical accounts of the plant under the name *dendromalache.* It was used by the Thracian Getae, a nomadic group, in the sixth century B.C. Their shamans, known as the Kapnobatai, used the smoke to induce visions and oracular trances. Among the Turko-Tartar peoples, shamanic ecstasis played an important role in healing as well as funeral rites, and it has been thought by some that the "howling" reported by Herodotus among the Scythians was characteristic of the shaman or psychopompus. *Cannabis* trances provided the shaman with a spiritual guide to the netherworld.

The Iranian word for this plant was *bangha* and simultaneously referred to mushroom intoxication and *Cannabis* intoxication. Among the ancient Persians, the living as well as the dead could commune with Zarathustra through the intervention of *Cannabis.* From the Iranian tradition the plant found its way to India, where it was not indigenous. It soon became inseparable from religious ceremonies in which it was the "heavenly guide." *Cannabis* intoxication allowed the confused mind to become clarified and the senses to focus on the Eternal. Mixtures of *Cannabis* resin were used before reading holy writ or entering sacred places. This drink called *vijaya* is now often a small amount of resin in milk with various admixtures. The purpose is to attain the celestial union between man and God that cannot be attained in a state of mundane preoccupation. *Vijaya* was the favorite drink of the god Indra, given to man so that he might attain elevated states of consciousness. It seems likely that the route to Africa was by way of India, but it may have been through Saudi Arabia. We know that it was used in the Valley of the Zambezi in pre-Portuguese times (before A.D. 1500). Two uses were preeminent: a smouldering fire was banked with the plants, and the users, prostrate around the fumes, inserted reeds into the smoke and inhaled. The Dervish tradition was to mix *Cannabis* resins with various seed oils and drink the mixture to produce a trance that would provide a revelation. In the Belgian Congo the Balubas were united as brothers-of-*Cannabis (bene-Riamba)* when their leader did away with the many different tribal gods of the various territories and provided a union in this wondrous plant. It was smoked in gourds one meter in circumference. In North Africa where *kif* is the name by which the plant is known, it is carried in a pouch of several compartments containing various grades of *Cannabis.* Degrees of esteem or friendship are ascertained by the quality offered. The *kif* room of a house is an essential piece of architecture, for it is in these rooms that oral traditions are passed from generation to generation in a relaxed atmosphere provided by *kif.*

North Europe had a long tradition of using *Cannabis* fibers, whereas the use of

the resins is fairly obscure until around 1800. When Napoleon's battered armies returned from the Egyptian campaign, they brought hashish with them. Although the custom of using the resin was not immediately assimilated, it soon became popular in asylums for quieting unruly mental patients. It was, about mid-century, taken up by a group of writers and artists who founded *Le Club des Haschischins.* This elitist group met in the elegant Hotel Pinodan on the fashionable Ile St. Louis in an atmosphere of chimerical phantasmagoria that would lend itself to hallucinatory experiences. Dr. Moreau, who in 1841 began to treat the mentally ill with hashish (with great success), was the primary officiant at the monthly meetings. From a crystal vase he would dispense a spoonful of green hashish paste, pronouncing the dictum, "This will be deducted from your share in paradise." These monthly meetings were held regularly and conducted with the formality of a religious service. The intoxication that followed had many manifestations, but as Baudelaire pointed out, it would be within the confines of a man's physical and moral temperament, "Hashish will be for a man's familiar thoughts and impressions, a mirror that exaggerates, but always a mirror." It is the ceremonial aspect of this practice that makes it so very interesting. Is an elitist group of intellectuals sharing their ecstasies really so far removed from the shared ritual of the "howling Scythians"?

In 1963 the Mexican ethnologist Roberto Williams Garcia published a paper on *Cannabis* as "santa rosa" or "the herb which makes one speak." Among the Tepecanos in northwest Mexico, it was reported by Lumholtz in 1902 that *Cannabis sativa* was used under the name "rosa maria" when peyote was not available. Likewise, the Tepehua living in the mountains of Vera Cruz, Hidalgo, and Puebla use the "santa rosa" in a ceremony that is as elaborate as any religious activity that may be imagined. Prayers, music, rhythmic movement, dancing, and whistling all figure into this service in which *Cannabis* intercedes with the Virgin Mary as an earth deity. It is thought to be alive and is equated with the sacred heart of Jesus, which is displayed on an alter where the herb is sanctified. Were it not for the ritual use and praying, it is believed that the plant could steal a man's soul and make him sick, perhaps even kill him. It might produce a "fleeting madness" that could only be controlled by a shaman. If venerated and used sacramentally, however, it cures and intercedes for the sinner.

In conjunction with the above, it is interesting to note the sacramental aspects of the plant's growth in montane Oaxaca. Here we find as much ritual as in the use of the plant as a sacrament. The high altitude and volcanic soils produce a particularly potent strain of *Cannabis.* The intense ultraviolet light may be responsible for converting some of the inert cannabinoids to the active delta-one isomeric form. Agricultural traditions here are ancient, and we have no date for the advent of *Cannabis.* It has been suggested that it is post-conquest in this area, but that is by no means a certainty. *Cannabis* does not flourish in such extremes of climatic and edaphic pressures, rather it grows in a "tortured" fashion. This is further exaggerated by severe pruning and by pinching out the young shoots to form the plant into an urn shape. In establishing this form the resins containing the potent cannabinoids volatilize and recondense within the confines of the plant form

until it is encrusted with the narcotic material. This brings about hormonal changes in the plants that turn them to a bright red to red-purple. The plant looks like anything but *Cannabis*. As the blood-like color begins to appear, and the plant shimmers with crystalline resins, it is "crucified" by having two wooden splinters driven through the basal stem in the manner of a cross. The association between this practice and the aforementioned association between the plant and Christ is hardly fortuitous. These syncretic Christo-pagan religious traditions are suggested by the urn-shaped "heart" of red, the crystals that shimmer like traditional shamanic rock crystals, and the ritual crucifixion after which the plant is pulled from the ground and hung upside down. Even if the Indian is at this time concerned primarily with the potency of the resins, the religious implications are inescapable. This does not constitute the hashish that is exported, but an indigenous sacramental material.

There was a time when the resins of *Cannabis*, in a tincture, were a valuable medicine easily obtained in any drugstore. As recently as 1930, it was legal to utilize *Cannabis* and its derivatives in all but sixteen states, but the Tax Act of 1937 implemented such rigid controls that it was effectively eliminated from most pharmacies. The Federal Bureau of Narcotics was established in 1930 and yet little was done between 1930 and 1937, and it seems that marijuana was not considered a problem of any consequence. The era of prohibition of alcohol was in full swing. The Treasury Department reported in 1931 that "publicity tends to magnify the extent of the evil." Shortly thereafter the repeal of prohibition laws led to a greater interest in eliminating marijuana. By 1936 there was no indication that patterns of *Cannabis* use were changing, but priorities had shifted and the Federal Bureau of Narcotics spoke of "the urgent need for vigorous enforcement of cannabis laws," and with this they initiated the infamous "educational campaign" in which the plant was suddenly dubbed "the killer weed" that induced "reefer madness." Newspapers also changed their priorities, and the stories fed to them of mass murders, rape, and insanity were published widely and often repeated as evidence of the enormous danger. Posters were distributed to schools, and anonymously authored films depicted lives ruined by *Cannabis*.

One bit of irony is that in the formulation of laws by various states against *Cannabis* it is evident that many of the legislators were unsure of the plant that they were prohibiting. These laws were enacted in addition to the Uniform States Laws Conference of 1932. Thus, *Cannabis* can be found as "locoweed," "peyote," and even as "mushrooms." Most states prohibited marijuana under the Uniform Narcotic Drug Act along with opiates and made the penalties commensurate with opium use. Ironically, marijuana is not considered a narcotic under federal law, but as late as 1960 Commissioner Harry Anslinger gave testimony before the House of Representatives that marijuana use led to a "sort of jaded appetite." He mentioned New York and Los Angeles as being the centers of the problem and stated, "They start on marijuana and . . . well, they switch to heroin."

By 1962 the White House Conference on Narcotic and Drug Abuse heard testimony from senators and judges who resented harsh and unrealistic penalties and the extreme injustice of the existing laws. By 1967 the President's Commission

on Law Enforcement and Administration of Justice suggested that the hazards of marijuana were exaggerated and that long criminal sentences were unjust. It became apparent that the legislation was more harmful to society in its enforcement than the problem it was designed to control. If the average taxpayer was provided with an inventory of court costs and criminal maintenance costs, there would be a national scandal of unprecedented proportions.

Through a process of slow but steady repeal, old laws are gradually being supplanted with laws that tolerate a modicum of marijuana as a slight offense, usually a misdemeanor that is subject to a small fine or overlooked. There is no evidence that in those states where the laws pertaining to *Cannabis* have been relaxed there is any increase in criminal behavior. All evidence is to the contrary. This country is finally learning that severe punitive measures have never deterred a populace from indulging in those things that they enjoy. As the old propaganda is fading, respectable institutions and researchers are investigating the real physiological effects of regularly using *Cannabis*. A really thorough report has yet to be issued. Some hazards, such as lowered testosterone levels, seem to be established. The entire picture has yet to come in.

The attempt to regulate large-scale sale and transit of *Cannabis* by dusting the plants by plane with herbicides such as Paraquat has led to the dangers associated with herbicide consumption, for the suppliers still harvest the poisoned plants and market them without warning. The United States government has to face the embarrassment of a scandal whose effects far overreach the use of marijuana. We will have to see what long-term effects might be wrought by herbicides that have in some instances shown to be carcinogenic.

The resins of *Cannabis* have been given to dogs in massive doses without a single fatality. Whether smoked or ingested, the usual effect is a euphoric, non-aggressive feeling often accompanied by an increased appetite. As it is usually smoked, the effect lasts for about two hours. When ingested, the euphoria may be prolonged up to twelve or more hours. This depends upon the quality of the resin or leafy material: that is to say, the amount of delta-1-tetrahydrocannabinol present, as it is the primary euphoriant. When d-1-THC was administered intravenously in experiments carried out under the auspices of the National Institute of Mental Health, it was found this component persists in the blood plasma for more than three days, after which it is completely metabolized. The metabolites leave the body in urine and feces after eight days. However, THC, as a non-polar compound, is lipophilic and accumulates in fatty tissues of the body. This may explain the phenomenon of "reverse tolerance" in which chronic users need progressively *less* of the drug to feel the effects. Naive smokers are often disappointed in the failure to feel any significant effects. This data stands in marked contrast to the ever-increasing need for larger doses of such drugs as heroin and nicotine.

The specific role of delta-1-THC is to affect the central nervous system by altering the turnover rates of such neurotransmitters as norepinephrine, serotonin, and acetylcholine. The negative effects are predominantly *potential* hazards at this point. The reduction in testosterone and deleterious effects on the bronchial system are established. The conjectural hazards that are under investigation are possible

chromosomal damage, interference with the immune system, interference with DNA synthessis, irreversible brain damage, marked personality changes. These are all under investigation as *suspected* rather than known effects. If we enumerate the hazards of alcohol and cigarette tobacco on human health, it is clear that both present a greater number of known health and social hazards than *Cannabis.* It should be noted that studies conducted in Jamaica of users who had been chronically involved with heavy *Cannabis* use for over nineteen years failed to produce evidence of the above suspected effects. Further, no organic or physiological addiction develops, and withdrawal symptoms are not evident. As with most drugs, psychic dependence and habituation may follow protracted use. The experience of true hallucinations is dependent upon the utilization of very intoxicating forms of hashish in substantial amounts.

Soma is known to most readers as the stimulant, euphoriant and hallucinogen in Aldous Huxley's novel *Brave New World.* Few people know that the plant soma actually exists and has been used as a narcotic since the time of India's earliest civilizations. In Ancient Indian mythology Soma, the brother of Indra, was the giver of health, courage, long life, a sense of immortality, and almost every other virtue known. As a narcotic, soma is thought to have originated in the Hindu Kush mountain range of northeast Afghanistan. There is evidence that Aryan invaders carried the plant to India and Persia, where it was readily adopted because of its psychoactive properties. Many of the hymns of the *Rig-Veda,* which were sung earlier than 800 B.C., refer to soma as a liquor and as a god. Recent accounts of the history of *Cannabis* have attempted to equate hashish with soma or homa. Homa is a plant derivative celebrated by Zarathustra, prophet to the ancient Iranians. There is every reason to believe that these are the same plants, but it is unlikely that either is *Cannabis* or a preparation of hashish. In *Rig-Veda* IX 113, soma is spoken of as a fragrant liquor, and in *Rig-Veda* X 85:3 there is a description of soma drinkers who "crush the juice from the plant." Neither of these suggests hashish or its mode of preparation. Phillipe de Felice, who wrote extensively on the uses of drugs in religion, adduced evidence that soma was a creeper or a vine, and *Cannabis* is bushy or upright.

Attempting to establish the identity of soma in over 144 hymns of the *Rig-Veda* has occupied ethnobotanists for some considerable time. These writings of the earliest settlers in the Indus basin are deliberately elusive on the point of the identity of soma. In this area and Iran there are several plants that are used under the name soma or homa, and yet these may not represent the soma of antiquity. The sporadic references to the plant in the *Rig-Veda* are elliptical and even contradictory. This plant that makes the gods dance and rejoice, produces mental exhilaration, increases the greatness of the priest in his sanctuary and of men, is strong drink for the omnipotent, is expressed by pounding it from the plant with stones, is mixed with milk, it speaks from the wooden bowl, it has swollen stalks which are milked like udders. These are a few of the most direct allusions to soma; others are far more oblique. We are also faced with the dilemma of distinguishing between references to Soma, the god, and soma as a plant or plant product. Although

most of these are concentrated in Mandala IX of the *Rig-Veda*, they may be found throughout the work. One major obstacle to uncovering the plant soma is the disagreement between Vedic scholars as to the precise interpretation of these texts. Max Muller, one of the greatest of Vedic scholars, stated in the preface to his 1891 translation of this work that translators of Vedic mandalas "ought to be decipherers, and that they are bound to justify every word of their translation in exactly the same manner in which the decipherers of hieroglyphic or cuneiform inscriptions justify every step they take." In the continuing Vedic scholarship this dictum has not always been followed, and literal interpretation has too often given way to poetic license and interpretation over translation. This is true of the translations of Wilson and Cowell, Griffith and Langlois.

The most recent assay to identify soma has been attempted by R. Gordon Wasson. Wasson relied on the translation of Geldner and that of Renou. It is the most thorough attempt yet to answer the age-old question of the botanical identity of soma, and it was done with the authoritative aid of W. D. O'Flaherty, an expert on Vedic culture and linguistics. Wasson perceived in these texts the absence of any mention of roots, leaves, branches, seeds, or fruits, and since the authors of the *Rig-Veda* do not mention these components, Wasson believes that they did not exist. Therefore, he asserts, the plant must have been a mushroom. Since the fly agaric, *Amanita muscaria,* is a montane plant and has a history of serving as an intoxicant among Siberians, it is put forth as the soma of the Hindu Kush or Himalaya foothills (Pl. 22). Wasson is aware of the limitations imposed by the infrequent presence of substantial numbers of these plants in the areas identified. This he believes may be answered by the assertion that Vedic priests had porters traveling to the forest belts of Eurasia to supply "the Divine Plant." This journey of thousands of miles to procure a plant considered divine hardly seems likely. It is difficult to find a single instance of an ancient culture that culled its sacred narcotic plants from a distant source. Some contenders for soma from previous investigators have been *Periploca aphylla, Ephedra* spp., *Rheum* sp., and *Sarcostemma brevistigma* (Pls. 23 & 24). Before dismissing these plants from the list of possibilities, we must investigate some of the assertions in light of their probability. As D. H. Ingalls, a Vedic scholar and supporter of Wasson's thesis, states, "Not all the epithets remarked on by Wasson need to be taken just as he takes them." Ingalls further notes, "I think Wasson's basic identification is a valuable discovery. But when a new tool is given to scholars, it is as important to prevent its misapplication as it is to recognize its value." He goes on to discount the Wasson thesis of "the third sieve," which states that the worshippers drank soma pissed out of the bodies of the priests. The interpretation is limited to a single verse in ten thousand verses of the *Rig-Veda* and is an extension of a practice among Siberians unknown to ancient Vedic people.

A few years ago a German pharmacologist, Hummel, wrote a treatise on soma in which he identified the plant as *Rheum palmatum*, or one of several other Asiatic species of rhubarb. The inherent problem is that *Rheum* species are non-narcotic. He suggested that any of four species of rhubarb were crushed and fermented with sugar or honey to give an intoxicating beverage. Max Muller instigated the idea of soma being a fermented beverage based upon the two kinds of intoxication

mentioned in the *Rig-Veda:* that of soma was without "evil effect" and that of beer was said to produce anger and folly. Each type of intoxication is based upon a different word. This has led to the supposition that soma could not be an alcoholic beverage. We need only look into the Christian tradition to find wine as a sacrament representing the blood of Christ, and wine as a mocker. Such a duality should not so easily disconcert translators. One of the attributes in these Sanskrit texts is that of intoxication and another is sweetness. Rhubarb leaves are emetic, and we might suggest that ritual emesis has been almost universally known as an act of cleansing and purification.

About the time of Hummel's thesis, a theory was advanced by the pharmacologist Quazilbash that soma was either *Ephedra pachyclada* or *E. intermedia.* Both are natives to the mountains of northwest India and have the advantage of being leafless, thus more in accord with the Vedic descriptions than *Rheum,* which has a very large leaf. Quazilbash maintains that in order to fit these Vedic hymns the plant had to be soaked in milk, crushed, filtered, mixed with honey, and the brew allowed to ferment. Such a mixture would then contain alcohol as well as ephedrine and pseudoephedrine and would serve as a psychoactive plant that would produce not only the stupor of alcohol, but the "exhilaration" that the *Rig-Veda* speaks of repeatedly. It seems clear that alcohol alone could serve only as a neural depressant and could not account for the states of ecstasy that soma provides. Even today these leafless, sun-loving plants are prepared in Khyber and parts of Afghanistan by boiling them in milk. The brew is thought to be an aphrodisiac and is most certainly a stimulant. Could this be a vestigial practice relating to an earlier soma ceremony? It is not an untenable hypothesis.

Those who have proposed *Sarcostemma viminale (Asclepias viminale)* as the holy herb fail to take into account that it is African and not Asian, and the juice is quite toxic, finding use as a fish poison. If we consider which plants found in Pakistan and the Hindu Kush and Pamir mountains of northwest India might be likely candidates, two come to mind: *Periploca aphylla,* a leafless decumbent herb or liana with milky latex, or the related *Periploca hydaspidis.* It was in 1885 that Julius Eggeling, noted for his Sanskrit translations, proposed *Sarcostemma acidum* as soma. Eggeling expressed doubts over his assertion, but indicated that every possibility seemed to favor *Sarcostemma brevistigma (S. acidum).* This leafless sprawling plant has many of the attributes found in the *Rig-Veda.* It is a series of branching stems that are quite leafless, and it grows in full sun (IX:86). When the seeds are released from the capsule, they emerge through a single suture that is like the opening of an eye (IX:10 and 97). These seeds, typical of the family, are released in a cloud of silvery comose down after leaving the leathery fruit coat, "he abandons his envelope . . . with what floats he makes continually his vesture of grand-occasion" (IX:71), and soma "shines together with the sun" (IX:2); "he has taken the back of heaven to clothe himself in a spread-cloth like to a cloud" (IX:69). We could give further examples in which the comose down is a cloud or silver or like sheep. The copious milky juice of *Sarcostemma* is reflected in these verses of the *Rig-Veda:* "When the swollen stalks were milked like cows with udders" (VIII:9), "Milking the dear sweetness from the divine udder . . ." (IX:107), "The udder of the

cow is swollen; the wise juice is imbued with its streams" (IX:93). These allusions are extremely frequent. As to the "navel of the earth" (IX:72), we have the perfect figuring of a navel in the round involuted center of the flower of *Sarcostemma.* It is this that gives way to the leathery fruit—"The hide is of bull, the dress is of sheep" (IX:70)—that conceals the seed with attached comose down. The form of this fruit is not unlike the horns of steers or bulls, "This bull, heaven's head . . ." (IX:27). Thus, we present but a few of the many verses in the *Rig-Veda* that could be applied to *Sarcostemma acidum.* Wasson has found them equally applicable to *Amanita muscaria,* the mushroom.

We know that *Sarcostemma brevistigma* is used in India today under the name soma, as are several other plants including *Ephedra* species. It may be that all of these are surrogates, or it is quite possible that *Sarcostemma brevistigma* is the plant soma of antiquity. A thorough chemical analysis of the latter to establish the presence of an intoxicating narcotic is in order. It is known that the dried stem is an emetic in Indian medicine, but what of the fresh milky latex? Certainly the herb is worthy of more investigation than has been conducted to date. In a volume entitled *Medicinal, Economic, and Useful Plants of India* by Sudhir Kumar Das, the foreword notes that the "therapeutic uses of plant materials have been quoted from records of the findings made through the ages by Hindoo Ayurvedic Pharmacists." In this compendium of ancient sources, *Sarcostemma brevistigma* is listed with the following note: "Herb. Plant juice is *intoxicating* and blood purifying." Such evidence is only circumstantial, but most intriguing. We must keep in mind that soma was a dangerous drug, that on occasion made Indra, brother of Soma, quite sick.

The contention by Wasson that soma is irrefutably and without a doubt the basidiomycete *Amanita muscaria* is disconcerting. No one has done a more thorough study than Wasson in an attempt to identify the plant soma, and his assertions must carry the weight that is commensurate with the scholarship that is to be found in *Soma, Divine Mushroom of Immortality.* The reader must bear in mind that interpretation is a thing apart from translation, and the ideal interpretation would come from a Vedic scholar who is also a botanist. Wasson's scholarship has opened new doors for us and is not to be taken lightly. It is a model for ethnobotanical research. Whether this resolves the age-old question of soma must be left to the reader.

What is the history behind the fly agaric, *Amanita muscaria,* that might engender a thesis such as that advanced by Wasson? We know that this mushroom contains the toxin muscarine in varying amounts, depending upon the area in which the fungus grows. It also contains the hallucinogens ibotenic acid and muscimole. This mushroom may be found in the temperate areas of the world following the belts of birches, beeches, alders, and pines. In its more southerly distribution it may be found about groves of eucalyptus and oaks. In the histories of the north European countries it appears as the mushroom in children's books having a red cap flecked with white. It is almost always portrayed in stories involving elves and dwarfs, the mystical little people of the forest found in the legends of most north temporate cultures. It was Lewis Carroll (Charles L. Dodgson) who popularized the idea that a

mushroom could make a person very large or very small in the eyes of those who partake of it. He had read a review of Cooke's manual on British fungi that contained an account of the properties of *Amanita muscaria;* these were translated into the experiences of Alice when she encountered a prophetic caterpillar in Wonderland.

We know of the antiquity of *Amanita muscaria* intoxication among the tribes of northeastern Asia, the Tungus, Yakuts, Chukches (Chukchees), Koryaks, and Kamchadales. It has also been used extensively among the Finno-Ugrian peoples, the Ostyak and Vogul. The earliest account of these practices was narrated to Europeans when in 1730 a Swedish army officer published his account of imprisonment in Siberia. In 1762 Oliver Goldsmith described his experiences of the use and ritual surrounding this colorful fungus. Since the mushroom is not abundant in northeast Asia, a curious practice has developed. Women of a tribe chew the dried fungus into a pulp, which is rolled into sausage-shaped pieces of a few inches in length. These are eaten by the men of the tribe. Two fungi are usually enough to produce a state of gaiety and exuberance. After passing through the kidneys, the mushroom is detoxified of muscarine and yet the potent muscimole, produced by the decomposition of ibotenic acid, is still abundant in the urine. As testimony to this, we have the words of Goldsmith:

> *The poorer [Tartars] post themselves around the huts of the rich and watch [for] the opportunity of the ladies and gentlemen as they come down to pass their liquor, and holding a wooden bowl catch the delicious fluid. Of this they drink with the utmost satisfaction and thus they get as drunk and as jovial as their betters.*

Keenan, who was among the Chukches in 1870, reported that a single mushroom was sufficient to keep a band intoxicated for a week, and a single mushroom would fetch three or four reindeer. This is interesting in light of experiments with *Amanita muscaria* in Cambria Pines, California. My informant relayed to me an experience in which he consumed eight of these fungi. Only after such a large dose did he feel any effects, and these were loss of motor coordination, paranoia, and uncontrolled speech. Obviously this fungus shows great variability throughout its range. The other possibility is that an in vivo processing of ibotenic acid to muscimole may be more efficient in bodies of differing physiology. If ibotenic acid decarboxylates and loses water, it becomes five times as potent, for it is then changed to muscimole. Muscazone is found in lesser amount and is pharmacologically less active.

Could this Siberian tradition be allied to the cult of soma? Could this area have been one of the sources for *Amanita muscaria* via an incredibly long trade route? Is this the source for the practice of the priest pissing soma as indicated in the *Rig-Veda* interpreted by Wasson? We know that the Siberian uses involved eating the mushroom after it had been dried in the sun or over a fire, extracting the juices in water and sometimes drinking them with an admixture of reindeer milk. These practices do correspond to many of those indicated in verses of the *Rig-Veda.* The practice of mixing the mushroom with the juice of *Vaccinium uliginosum* or

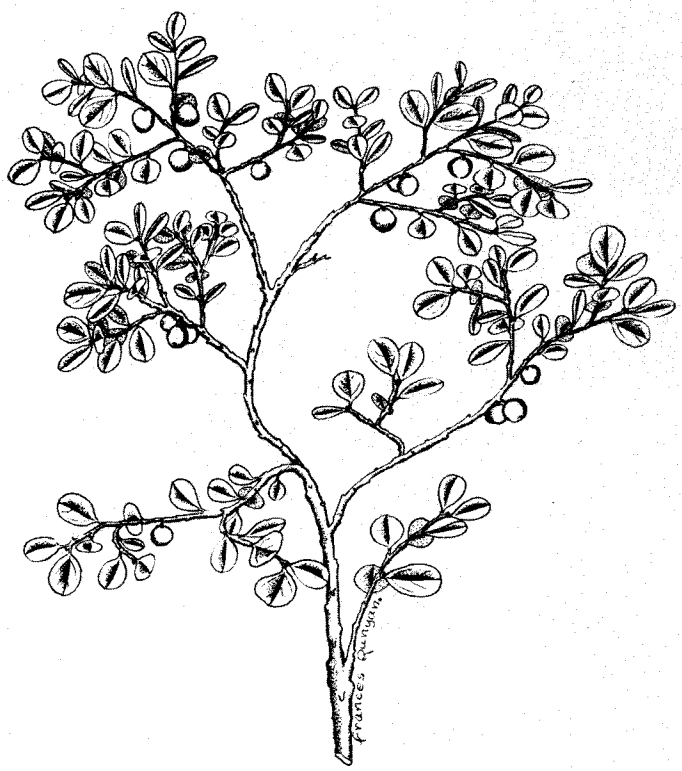


FIG. 31:
Vaccinium uliginosum

Epilobium angustifolium is most interesting (Figs. 31 & 32). In Millspaugh's *American Medicinal Plants*, he mentions several species of *Epilobium* as being used for cramps, diarrhoea, and dysentery. The preparation involves chopping and pounding the entire plant. In addition to the expected effects, he noted that the tincture "caused some symptoms that must have been due to so large a drink . . . symptoms that we are prone to lay to the alcohol." Citing the works of Dr. Wright, who took one-half ounce of the tincture and became intoxicated, we have reason to believe that perhaps there is an intoxicating principle in *Epilobium*, for one-half ounce of a tincture of the plant plus alcohol is a small amount of alcohol in terms of giddiness or intoxication. This same author says of *Vaccinium uliginosum* that it is intoxicating and narcotic. Could it be that some of the effects ascribed to the *berserker* of Scandinavia, who went into impassioned frenetic states of orgies and murder, used not only *Amanita muscaria*, but also these narcotic admixtures? *Vaccinium vitis* was used by the Shakers as a substitute for the related *Arctostaphylos uva-ursi*, whose leaves were smoked as *sagack-homi* in Canada and as *kinikinik* among western hunters. These admixtures to the mushroom are much ignored.

John Allegro, who has distinguished himself as a translator of ancient languages, extended the *Amanita* argument in a book entitled *The Sacred Mushroom and the Cross.* Using linguistic arguments that begin with Sumerian tablets from Arcad and Erech, he traces the mushroom through several cultures and finds it to be a focal point in the Christian tradition. The strong sexual interpretations of these practices all but occlude the argument. One strong point in favor of Allegro's argument is a fresco dating from 1291 on a wall of a deserted church in Plaincourault (Indre, France) which shows Adam and Eve posed on either side of the "Tree of Life" depicted as a large branched *Amanita muscaria* with a serpent wrapped about it. The forbidden fruit in the mouth of the serpent, Satan, is either an apple or a piece of the red *Amanita* cap (Pl. 25). Did the celebration of *Amanita* as a sacred plant exceed that of all psychotropics from many different cultures? Did this tradition originate in the cult of soma among the Vedic peoples? Was soma really *Amanita,* or *Ephedra,* or *Sarcostemma*? One thing remains a certainty: the story of soma has not yet reached its terminus, and the ancient scribe who once penned the following characters in Sanskrit had a yet unraveled secret:

Heaven above does not equal one half of me.
Have I been drinking soma?
In my glory I have passed beyond earth and sky.
Have I been drinking soma?
I will pick up the earth and place it here or there.
Have I been drinking soma?

Rig-Veda X:119, 7–9

Datura is a genus of almost pan-temperate and pan-tropical distribution, and the origin of this highly variable genus is disputed by botanists. The narcotic qualities of *Datura* led to its use as a medicine and mind-altering agent at a very early date in both the Old and the New worlds. Avicenna, the Arabian physician of the eleventh century, noted the intoxication produced by a small amount of the *Datura* "nut" (seed) and wrote of its value in medicine. The generic epithet was derived from early Arabic names for *Datura: datora* and *tatorah.* Both of these may be traced to the term *dutra* in India or some of the early Sanskrit writings, in which it is mentioned as *dhustura* and *unmata.* These were probably all names for a single species, *Datura metel* (Fig. 33). The specific epithet of *metel* may derive from the Arabic drug of which Avicenna wrote, *jouz-mathel.* While it is thought that the greatest area of ritual use is now in the area from north Mexico through South America, I believe that this may be due to our lack of knowledge of some of the earliest practices in the Old World, where the plant dates to prehistory. Perhaps no more diverse kinds of practices exist with respect to hallucinogenic plants than we find in *Datura* intoxication. This may seem astonishing considering the extremely toxic nature of the entire plant. It is equally curious that the customs surrounding

FIG. 32: *Epilobium angustifolium*

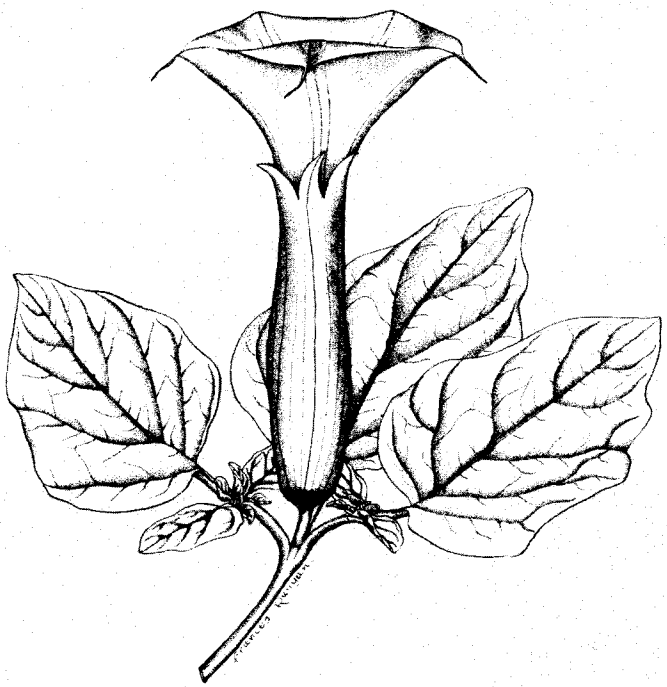


FIG. 33:
Datura metel

the use of *Datura* in temperate Asia at a very early date parallel those of contemporary native peoples of the New World.

Because a concoction of ground seed with water has the power to stupefy, it became a popular drug among thieves and criminals who would use this drug, often with hashish added, to intoxicate their victims. This was a common practice in India, where the same plant was used to treat over twenty diseases including pneumonia, heart disease, mumps, sexual perversions, toothworm, hysteria, epilepsy, and other real or imagined conditions. The liquid extracts of *Datura metel* were useful in drugging young girls and exploiting them as prostitutes; subsequently they would employ extracts of the herb as "knockout drops" to take advantage of their clients. It is no wonder that in India the plant came to have an evil reputation, and those who used it were the *dhatureas.* Only in China was it without the reputation of an evil plant, for there it was sacred and received droplets of water when Buddha spoke. It originated when Buddha promulgated the law. It was then that the plants descended from heaven. Both the flowers and seed of *Datura alba* were used in China under the name *man-t'o-lo* for pustules, swollen feet, prolapsus ani, colds, cholera, and a host of nervous disorders. Equal quantities of this plant and *Cannabis,* dried, pulverized, and steeped in wine, were used to perform operations

and cauterizations without pain. It was noted that when used as a medicant *D. alba* often produced a giddy state of laughing and dancing. We do not have a fine record of magico-religious use as we do in the Americas.

SOUTH PACIFIC

Kaempferia galanga is an attractive herbaceous perennial found in loamy soils and shaded areas of New Guinea, India, Malaya, the Moluccas, and the Philippines (Pl. 26). From a pair of glossy deep green leaves there emerges a spike bearing a few pale white flowers mottled violet and having a creamy yellow throat. Under the name *gisól,* the rhizome is used as a ginger-like condiment, and the juices are expressed for sore throats, to accelerate scar tissue formation, and on boils and similar skin eruptions. A related species of tropical Asia, *K. angustifolia,* figures importantly in cough medicines. Because of the fragrance of the rhizome, it is also important in perfumes. In Cambodia, *K. pandurata* is used in colic and stomach ailments, and in Java and surrounding territories the species *K. rotunda* can be found in materia medica as being official for gastric complaints. It is said that *gisól* is useful in severe headache and relieves pain at childbirth. Apart from these fascinating medical applications for this plant, it has been regarded by some groups in New Guinea as a hallucinogen. As *maraba,* the oily juice of the rhizome is consumed. Thus far it has not been possible to identify a psychoactive principle from *K. galanga* or any related species, and we might suspect it to be a semi-sacred plant around which an elaborate psychodrama mimicking hallucinations is witnessed; however, there are a number of plants that have been demonstrated to be psychoactive for which we have no phytochemical information that would support these as hallucinogens. This is the only member of the ginger family that has been reported as a hallucinogen.

Agara is the name by which the Papuans know the timber tree *Galbulmima (Himantandra) belgraveana* (Fig. 34). This is one of the several species found growing in eastern Australia and eastern Malaysia. A decoction of both the leaves and bark is made and added to leaves from *Homalomena ereriba,* an herbaceous aroid (Fig. 35). The resulting mixture, when drunk, or the bark and leaves chewed together, produces fits of violent intoxication accompanied by spectacular visions and dream-like states that terminate in a deep somnolence. Reports from the Papua, New Guinea, Scientific Society indicate that several isoquinoline alkaloids have been isolated from *Galbulmima belgraveana,* among these himbosine, himbacine, himgaline and others. The structure of most of these alkaloids has now been identified, but none seems to show any hallucinogenic activity. Only himbacine's anti-spasmodic action would seem to make it more suspect than the others. While no hallucinogenic compounds have been isolated from *Homalomena ereriba, H. rubescens* of Malaysia is used as a fish poison under the name *ipoh.* Chemical studies of the *Homalomena* species are few, and yet over one hundred forty species are known from tropical Asia and South America.

The islands of Hawaii are famous for the attractive plant materials shipped to the mainland of the United States and to the rest of the world to be used in dried

flower arrangements or as seeds in jewelry. Prominent among these is the "Hawaiian baby wood rose," which is not a member of the rose family, but is a tropical woody liana of the morning glory family (Convovulaceae). The black seeds within the capsule, which forms after the appearance of the flower, have been used among the poorer Hawaiians for a "high." Unfortunately, the complex alkaloids of these seeds of *Argyreia nervosa* provide not only hallucinations, but a hangover characterized by blurred vision, vertigo, and physical inertia (Fig. 36). In the genus *Argyreia* there are thirteen species containing amides of lysergic acid *(speciosa, nervosa, acuta, barnesii, wallichii, capitata, splendens, osyrensis, aggregata, hainanensis, obtusifolia,* and *pseudorubicunda).* It was not until 1963 that the presence of amides of lysergic acid were ascertained to be present in *Argyreia* species. Since then there have been several embargos, and a great deal of controversy over the propriety of shipping these fruit capsules and seeds throughout the world. The presence of D-lysergic acid (ergine), isoergine, chanoclavine, elymoclavine, and ergonovine are responsible for the effects experienced, but it is the D-lysergic acid that is responsible for the potent hallucinatory experience. Species of *Ipomoea, Rivea, Claviceps,* and *Stictocardia* are all chemically related to *Argyreia* and will be discussed in the context of their geographical origins and places where they are used. Suffice it to say that all of these are the natural sources for chemicals that are closest to the most potent psychotomimetic known, LSD-25, and most have an antiquity of use extending over hundreds of years.

One of the most fascinating recent ethnobotanical studies covering the area of New Guinea was presented by Harold Nelson at the sixty-ninth Annual Meeting of

FIG. 34: *Galbulmima belgraveana*

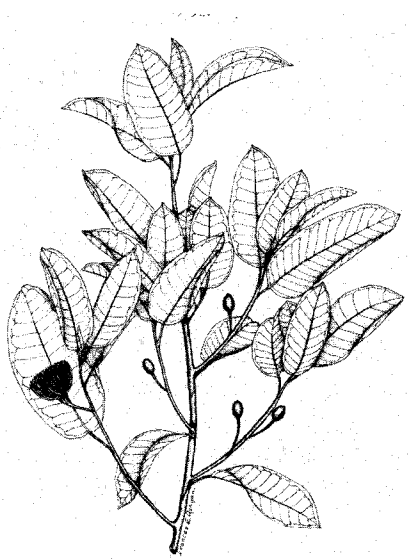


FIG. 35: *Homalomena* cf. *ereriba*

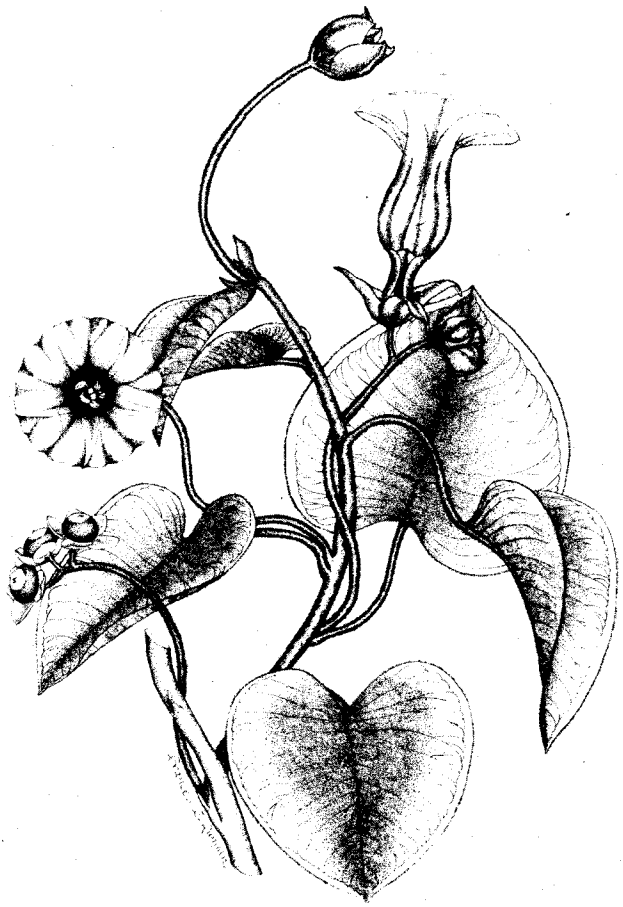


FIG. 36:
Argyreia nervosa

the American Anthropological Association in November 1970. "Mushroom madness" had been laconically noted by Fr. William Ross in 1936, and an inquiry into this phenomenon was initiated by Marie Reay, who worked in the Wahgi Valley in the Western Highlands of New Guinea. Nelson lived with the Kaimbi people in the Bebilyer Valley along the southern slopes of the Kubors during 1967–68 and documented some of the lore associated with this curious seasonal madness. These people know the mushrooms of the area as *nonda*, and the effects of tremors, multiple vision, asphasia, jumping, and feigning attacks upon creatures seen by the "mad one" are similar to reports by Reay. Sexual delusions and patterned lewdness reported by Reay were not observed by Nelson among the Kaimbi. Roger Heim, the famous French mycologist, identified all of the *nonda* encountered by Reay after the team of Reay, Heim, and Wasson revisited the Wahgi for three weeks in 1963. This team found some additional *nonda*, previously unidentified at this time. In their

1965 report the team presented *Boletus nigroviolaceus, B. nigerimus, B. kumaeus, B. reayi, B. manicus, Heimiella anguiformis,* and an unidentified *Russula* (Pl. 27). All have been implicated in the manic states called *ndaadl,* which is experienced by females, and *komugl-tai,* which is the male form of the mania. Children have occasionally been known to suffer "mushroom madness" as well. Nelson asserted that the behavior, as distinct from true madness, is temporary and has socially defined limits. Heim and Wasson concurred in believing that "mushroom madness" permitted cultural psychodramas to be enacted harmlessly with the mushroom being the scapegoat. For Reay, the madness was "institutionalized deviance," or a sort of ritualistic rebellion.

Among those who have worked on the New Guinea mushroom madness, there is controversy as to whether the mushrooms actually lead to physiologically based madness, or whether it is a combination of social and psychological factors. Nelson has adduced a substantial body of information supporting the contention that it is a chemically based intoxication. Further, he notes that the Kiambi are unanimous in their judgement that at least two of these mushrooms lead to a madness that is a "bad trip," and the madness in one instance may last for as long as two months. It is sometimes necessary to overtake the affected person and physically restrain him by binding him or her with ropes and roasting the madness out very near to a fire. The delusions are sometimes expurged by dunking the victim in cold water.

The preponderance of evidence seemed to weigh against Nelson for a time, but in 1967 Roger Heim published some additional notes on new investigations of hallucinogenic fungi in the memoirs of the National Museum of Natural History in Paris. These have not been translated into English, so a synopsis of some of the information on New Guinea is in order here. Heim continues to support the contention that the temporal derangement is theatrical simulation, but notes that on a sojourn to the village of the Kondambi in Kuma country he discovered two meadow species of psychotropic *Psilocybe.* In this instance Heim mentions only *P. kumaenorum* growing in grassy meadows "somewhat hidden." This brown-black fungus that turns purple-black to gray-green at maturity is unique in being the first encounter with *Psilocybe* outside of Meso-America (except for *P. semilanceata* of Europe, which is indistinguishable from *P. wassonii,* native to the Tenango del Valle region of Mexico). Heim believes that this fungus in New Guinea is not used for intoxication due to an ignorance upon the part of the natives as to its properties.

Keeping in mind that the Wasson-Heim team spent only a few weeks in the area, we may propose that the practices of the people were not made fully known to them. Earlier, Wasson and Heim reported that the Wahgi had no agreement among them as to which mushrooms induced the madness. All of this assumes that the anthropologist and ethnobotanist going into a remote area will be given full information of an accurate nature by their informants concerning plants that they believe to be of a magical nature. I believe that such a presumption is untenable. We have had similar experiences in Mexico where searching for magic plants failed to turn up such species as *Salvia divinorum* for centuries after such inquiries were initiated. In the last several decades a number of astonishing reports have emerged. New Guinea is filled with fungi of numerous genera, many of which have yet to be

identified or even collected by non-natives. Almost no information exists as to the chemical constitution of these mushrooms. It is necessary that biochemical assays be made in order to ascertain the composition of the fungi and more thorough observations over longer periods of the mushrooms employed. It seems unlikely that given the broad use of mushrooms, the presence of *Psilocybe* with its potent intoxicating psilocin and psilocybin would be ignored by native inhabitants only to be discovered by a non-native visiting the area. One is obliged to concur with the thesis of Nelson that at least a part of this often protracted madness is genuine mushroom hallucination. Even in the use of other known hallucinogens, we see a strong influence of culturally conditioned behavior that is also cultural psychodrama.

AFRICA

Members of the cult of Bwiti (Bouiti) in Gabon revere a forest shrub, *Tabernanthe iboga,* which they associate with the dwelling place of their ancestors. In the Bwiti mythology the Creator God dismembered a pigmy and buried his parts in the forest. His wife discovered that plants had risen from her husband's flesh. She was instructed by the Creator God to eat of their roots so that she might once more communicate with the spirit of her dead husband and moreover have a knowledge of the supernatural. From that time hence the Bwiti have venerated *Tabernanthe iboga* and partake of its flesh by digging the root and chewing on the root cortex (Fig. 37). Three hundred to eight hundred grams of crude root bark may be consumed by one individual in the course of a day, resulting in an altered state of consciousness often characterized by verbalization of the visions seen. This state prompts divination of illness, permits a knowledge of the "true religion," allows the fetish to enter. The initiate may be given massive doses to open his mind to the Bwiti way. It is also believed that the root is an aphrodisiac and thus cures impotency. The cults of *iboga (eboka)* use are to be found among the Oubanghi tribes of Cehari as well as the natives of Lambarene in Gabon, formerly a part of the French Congo. Vomiting and loss of motor coordination characterize the intoxication, and the attendant visions are of strong colors. Dramatic presentations of the visions include stories of seeing a great tumult, speaking to specific ancestors and relating their conversations, walking or flying the lengths of a great road, and a vision into the cave of life.

Initiates into the Bwiti cult are given forty to sixty times the normal amount of root bark ingested by cult members. This introduction results in vomiting, loss of motor coordination, and sometimes death. Deaths are taken to be a divine will intervening; the initiate was not prepared. Sick members of the cult may also be given these excessive doses in order to help them divine the source of their illness and know of its outcome. Although the French and Belgians made brief notes on a few of the uses of *iboga* as early as 1864, it was not until H. G. Pope in 1969 and J. W. Fernandez in 1972 published their accounts of this plant as a ritual hallucinogen that its significance was fully comprehended. The ritual elements of death, rebirth, the rites of oomphagos and sparagmos, the way of linking past and present through this plant bespeak strong transcultural ties with divergent areas and cults: the

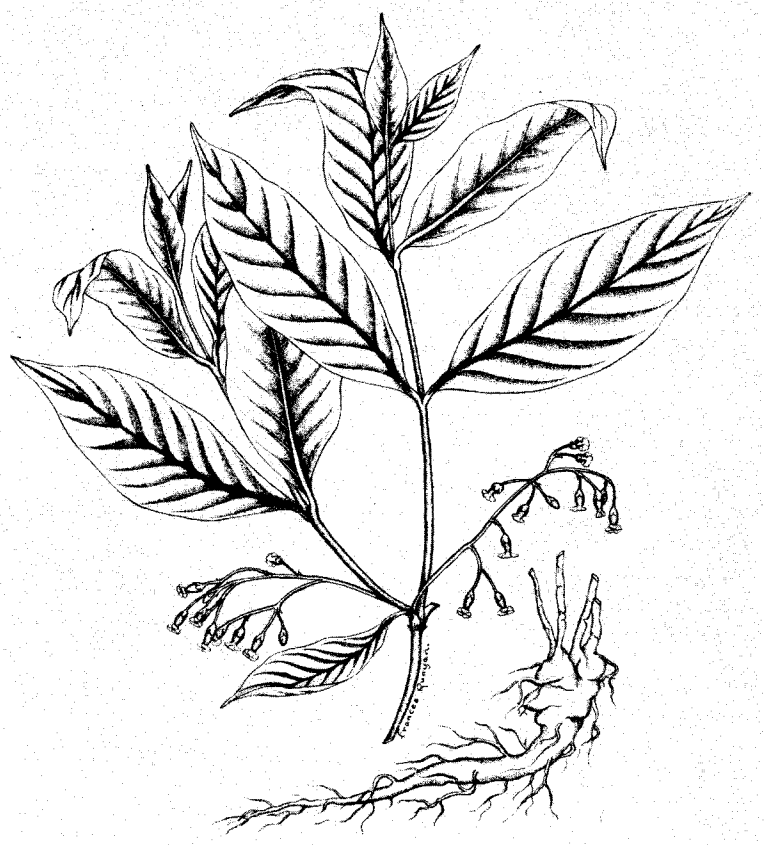


FIG. 37:
Tabernanthe iboga

Dionysian rituals, kava kava legend, peyote stories and rites, Mexican mushroom ritual, Amazonian *yagé* ceremony, and the Christian tradition. There is no compelling reason to believe that these syncretic elements were learned, but it seems that several have independent origins. The postulates of Jungian archetypes, cultural conditioning, chemical constants may all play a role, but the phenomenon is still essentially unexplained.

When the French occupied the territory of Gabon, they were impressed with the attributes of *Tabernanthe iboga* and sent the root cortex back to France, from which their chemists made a crude extract that they sold as Lambarene. Lambarene was used in western Europe at the beginning of the century to cure everything from neurasthenia to syphilis. Needless to say, its greatest popularity derived from its reputation as an aphrodisiac. It is only recently that ibogaine has been isolated as the active ingredient in the root. Six per cent of the dried root cortex contains twelve closely related indoles that may function together to produce the *iboga* intoxica-

tion. The ibogaine fraction is known to function as a cholinesterase inhibitor and stimulant as well as functioning as a hallucinogen. Admixtures to the root include as many as ten different plants: *Cannabis, Nicotiana, Alchornea,* and *Elaeophorbia* are but a few genera often added.

Elaeophorbia drupifera, which is common on coastal plains and in forest areas, has a host of names including *kankan, dolo, tulo, toro,* and others (Fig. 38). It grows into a tree up to fifty feet high bearing small greenish flowers that are displaced by a yellow-orange fleshy fruit. This fruit is often eaten by browsing antelopes, but crushed with the leaves, it serves as a fish poison. The latex of this tree is quite caustic and if rubbed into the eyes, results in permanent blindness. For centuries it has been used in Africa to cure scorpion stings, warts, ringworm, and is added to eggs as a purgative. It is the latex that is added to *iboga* root bark and may be a

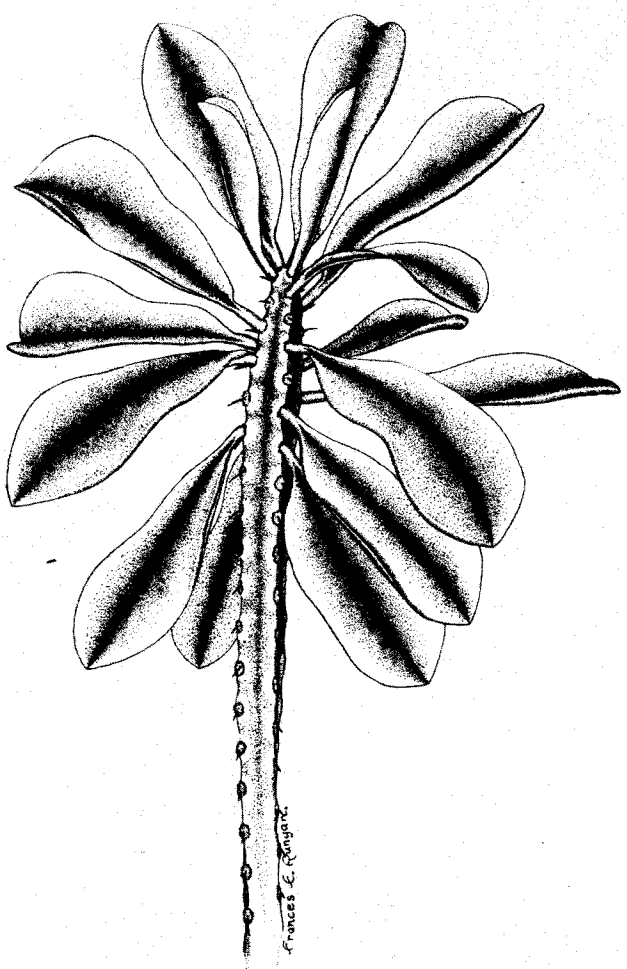


FIG. 38:
Elaeophorbia drupifera

FIG. 39:
Alchornea floribunda

hallucinogenic additive known by the natives as *ayan* and *beyem.* It is said to enhance the effects of another intoxicant in the area, *Alchornea floribunda* (Fig. 39). A direct use for *kankan* is to dip a feather into a combination of the latex and an oil and brush it across the eyeballs to produce extraordinary visions. This was a common practice among the Fang people, who are the predominant users of *iboga.*

Another important adjunct to *iboga* is the plant *Alchornea floribunda,* which is called *alan* by the Bwiti and generally known as *niando* in Liberia, Nigeria, and Uganda. It is a member of the spurge family (Euphorbiaceae) to which *Elaeophorbia* also belongs. Cults living south of the Fang (Bwiti) in Gabon mix *alan* with *iboga* even though it is generally regarded as having less power than *iboga* when used alone. Unspectacular in appearance, the small tree has a root bark that is macerated to form an alleged aphrodisiac and a strong intoxicant. Powdered *niando* is sometimes mixed with salt or food and eaten before tribal activity or warfare. Steeped in palm wine or banana wine, it produces an intense excitement that eventually culminates in a deep depression known to have been fatal on several occasions.

In 1958 a report from France indicated the presence of yohimbine as well as several unidentifiable alkaloid fractions in a sample of *niando.* Yohimbine has been

identified as an aphrodisiac and has hypotensive effects, while the unidentified fractions may account for the narcotic effects of the root bark. Later investigations failed to show the presence of yohimbine in the original sample, which may have been due to deterioration. *Niando* is a powerful plant capable of bringing great joy and profound sorrow. Its hallucinogenic status has been questioned; however, continued use among secret societies of the Byeri in Gabon suggest that it must have some unusual properties.

The genus *Mesembryanthemum* is a popular groundcover in the southwestern United States, but a section of the genus designated as *Sceletium* serves as a narcotic in South Africa. Kolbe reported on the use of *Sceletium* under the name of *kanna (channa)* over two hundred and fifty years ago. Two species, *S. expansum* and *S. tortuosum*, have long been in use by the Hottentots of Karroo (Figs. 40 & 41). Kolbe stated that they chewed the roots, keeping the plant in their mouths for some time and passing from an initial state of excitement in which "their animal spirits were awakened, their eyes sparkled and their faces manifested laughter and gaiety. Thousands of delightsome ideas appeared, and a pleasant jollity which enabled them to be amused by the simplest jests. By taking the substance to excess they lost consciousness and fell into a delirium." Lewin, reporting on Kolbe's observations, found it impossible to believe that these plants could produce such an effect and felt that perhaps Kolbe was confusing them with *Cannabis* or *Sclerocarya caffra*. Lewin added his further notes that both species of *Sceletium* were used on the Cape of Good Hope in the hinterlands under the name *kaugoed (gauwgoed)*, and on the

FIG. 40: *Sceletium expansum*, eighteenth-century woodcut

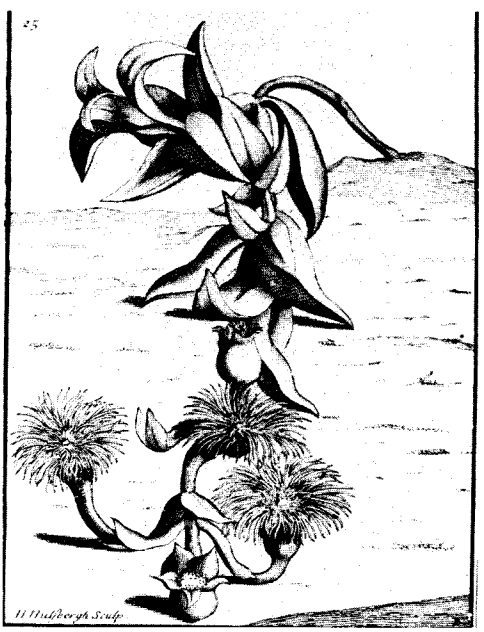


FIG. 41: *Sceletium tortuosum*, eighteenth-century woodcut

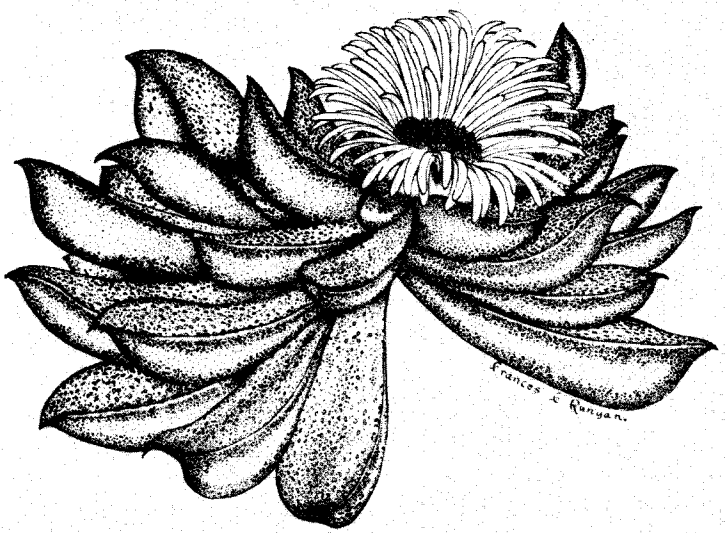


FIG. 42:
Nananthus albinotus

Karroo plateau and in Namaqualand the roots, leaves, and trunk of these are both chewed and smoked. He pointed to an unidentified alkaloid that would produce a torpor in man in the dosage of five grains. Subsequently, mesembrine and mesembrenine were isolated from these plants. The former produces a sedative-like effect. The toxic side effects from using the plants are headache, listlessness, loss of appetite, and depression. One of the reasons that we lack contemporary reports as extravagant as that of Kolbe is that the dosage was probably much greater in earlier times. Consider *Nicotiana* and *Tabernanthe;* neither of these produce significant effects in moderate doses, but massive doses have profound narcotic effects. Perhaps, on the other hand, there is some confusion between *Sceletium* and a related genus, *Nananthus. S'keng-keng* is the name by which a number of South African tribesmen, especially the old Griquas, know *Nananthus albinotus,* which they pulverize in its entirety as a hallucinogenic additive to their smoking tobacco or snuff (Fig. 42). A chemical analysis of *Nananthus albinotus* has yet to be accomplished.

The word *dagga* is familiar to many as the South African term for *Cannabis,* which enjoys a considerable popularity throughout Africa. Recently it has been ascertained that *dagga* applies equally well to several species of *Leonotis leonurus* (Pl. 28). This plant has come to many subtropical areas as an ornamental shrub under the name "lion's tail." From the leaves of this member of the mint family (Labiatae), a dark green resinous exudate is obtained and smoked with tobacco. An alternative mode of use involves pinching out the young shoots that are about to

flower and smoking them as a tobacco substitute under the name *dagga-dagga*. The Hottentots are quite fond of it as a narcotic, producing a mild state of euphoria much like some *Cannabis*. It is also used for diseases such as leprosy, cardiac asthma, epilepsy, and snakebite. Farmers and kaffirs appreciate the states of evanescence that *Leonotis* can provide.

Tropical East Africa has a wealth of plants whose medicinal values are known only to the people living in that area. Occasionally a medical journal will publish a note on these, but few have found their way into medical practice in Britain or the United States. In the Piet Retief region of Eastern Transvaal there grows *Monodenium lugardae*, a member of the spurge family that is little more than a pale-green club-shaped shoot terminating in a corona of simple leaves (Fig. 43). Yet this plant is of the greatest importance to the *sangomas*, the ritual diviners of that area.

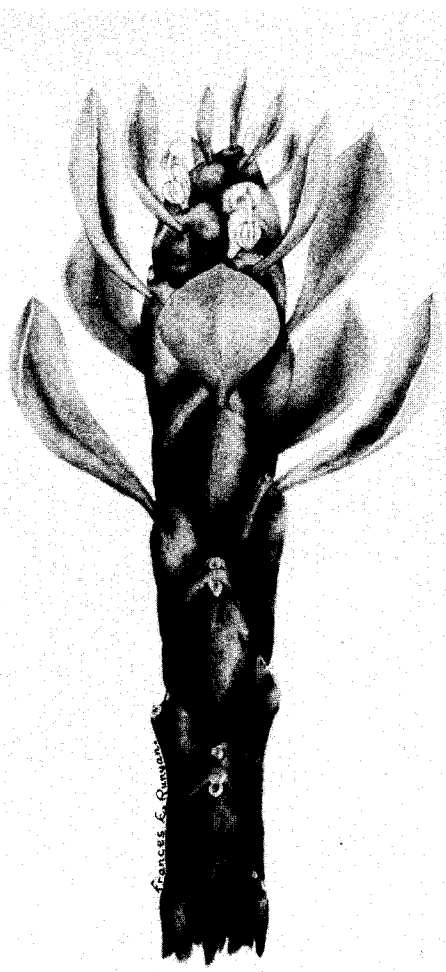


FIG. 43:
Monodenium lugardae

FIG. 44:
Pancratium trianthum

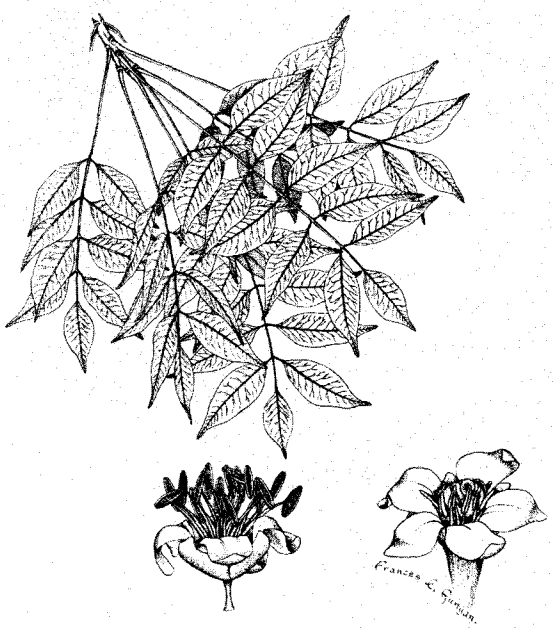


FIG. 45:
Sclerocarya caffra

These oracular figures will chew a piece of the root and swallow it to produce visions of a prophetic nature that will divine the illness and make the cure apparent. No chemical assay exists to determine the cause of the peculiar narcosis.

In horticultural practices the genus *Amaryllis* enjoys considerable popularity. Closely related to this genus, and in the same family, is *Pancratium trianthum,* often found growing around shrines and sacred areas (Fig. 44). It bears lily-like flowers of pink and white stripes on a naked scape. The bushmen of Dobe, Botswana, know this bulbous perennial as *kwashi,* a powerful sacred hallucinogen capable of producing vivid and colorful visions. The bulb is not eaten, but rather is slashed open and pressed onto self-inflicted wounds on the foreheads of participants. The intoxicating principle is transported directly into the circulatory system, creating an immediate reaction. A related species, *Pancratium speciosum,* is used by the Caribs of the West Indies under the name *ognon* or *gli* as a powerful emetic. Some species are quite narcotic and are reported to have caused death by paralysis of the central nervous system; still others are classified as cardiac poisons. *Kwashi* is perhaps one of the most unusual hallucinogens in terms of the mode of use, and one of the most dangerous. This is not a deterrent to ritual use.

The people of Zulu, Swazi, Tsonga, Sotho, and Venda refer to an attractive tree with shiny dark-green leaves as *marula* and *umganu.* This plant, *Sclerocarya caffra,* and its relative *Sclerocarya schweinfurthii,* are both used to form intoxicating beverages (Fig. 45). Lewin believes that either of these two species better qualifies for the title of *kanna* of the early Hottentots than other suggested species. *Sclerocarya caffra* rarely exceeds thirty feet in height and forms a crown in the shape of a hemisphere. It is a dioecious tree and bears red racemes of flowers on the male trees and small solitary flowers on the female. The latter form an abundance of yellow plum-like fruits at maturity and have the odor of turpentine when fully ripe. These fruits have been used to brew an exceptionally intoxicating beer. A man who has drunk of it is not allowed to bear arms. This too may be a form of social drama within a framework of anticipated behavior, for no evidence thus far has come from the oily fruit to establish it as hallucinogenic.

The distilled oils of common fennel, *Foeniculum vulgare,* were used as a medicine in Morocco at an early date to treat a variety of illnesses (Pl. 29). It was observed that therapeutic doses of the oil would sometimes induce an epileptiform fit of madness and hallucinations. This divine state of madness might be considered a revelation that would divine the nature of the illness. Its use in European witchcraft to ward off evil spirits would suggest powers beyond the ordinary have been associated with this fragrant perennial. Pliny believed that when serpents ate of it they would cast off their skins. It was said by the herbalists that this plant could restore lost vision. Fennel, dill, anise, and parsley all have similar oils, but it has been demonstrated that in vivo amination of these ring-substituted compounds can result in a series of three narcotic amphetamines. When these herbs are used as condiments, appreciable amounts of these oils are not taken into the system; oil distillates, however, could act as precursors to amphetamine formation. We know the ancient European practice of using dill tea (from *dillan,* to lull) to put infants to sleep has merit. This may be explained by the above chemical conversion.

Amphetamines have the opposite effect upon children and would cause a sedated state. These oils are undoubtedly more complex than our present analyses suggest. Longfellow said of the fennel plant:

Above the lower plants it towers,
The fennel with its yellow flowers;
And in an earlier age than ours
Was gifted with the wondrous powers
Lost vision to restore.

The host of plants that bear oils and are of the family Apiaceae are potentially psychoactive and merit further investigation.

NORTH AMERICA

In most instances plants with psychoactive properties have been used to achieve altered states of consciousness in the area to which they are indigenous; an extraordinary plant, such as *Cannabis* or *Papaver,* soon finds its way to other areas by way of early trade routes. It is far rarer for a plant to be introduced for ornamental or medical reasons and then enter into use as a psychotomimetic. This is the case with the Madagascar periwinkle *Catharanthus roseus* (formerly *Vinca rosea*) (Pl. 30). This small white, pink, or violet flowered herb is not only ornamental, but promised to become an important medicant in diabetes when it was found to contain a host of alkaloids rarely found in other plants. Soon this plant was elevated to greater prominence when it was found to contain not only reserpine, but vinblastine and vincristine. The latter two are capable of inhibiting the division of cells associated with several forms of cancer. It was noted by physicians that in this therapy one of the side effects was a state of euphoria with some hallucinations of a pleasant nature. When this information became generally known, there was an outbreak of *Catharanthus* smoking in Miami, Florida, where the plant grows as a weed. One of the alkaloids is of an ibogaine indole structure, which accounts for the hallucinogenic effects. A related species, *C. lanceus,* has been shown to contain more than five per cent yohimbine, enhancing the psychotomimetic qualities.

Unfortunately, the "high" obtained from smoking *Catharanthus* has severely debilitating side effects. Ataxia, loss of hair, skin sensations, burning sensations, and muscle deterioration follow extended use of this plant material. One of the immediate manifestations is a reduction in the white blood cell count, which makes an individual susceptible to a host of diseases. Long-term damage is yet incalculable. In the hands of psychopharmacologists, who isolate these alkaloids and use them therapeutically, they may be among the most promising of the new medicines from plant sources. Crude plant material of *Catharanthus* used by individuals for experimental euphoria can be extremely dangerous.

Datura, mentioned earlier in connection with Asiatic cultures, has had a prominent role in native medicine and coming-of-age rituals in the southwestern United States. Under the name *toloache,* derived from Aztec sources, the plant was used for almost every disease by native North Americans and for setting broken bones as

well as an anesthetic in operations. Like *Cannabis* among the Scythians, it was used in rituals following the death of a tribal member. Some tribes used the plant for snakebites and tarantula bites. Among the Hopis, the root of *Datura inoxia (meteloides)* was used for divining while the Yokuts and the Luiseños used large doses to initiate a boy into manhood (Pl. 31). Known by the Mahuna Indians of Southern California as *qui-qui-sa-waal,* it was a prime medicant against the venom of the rattlesnake.

The primary attribute of this plant is that it provides the trance state for passage of a youth into manhood, to sustain a person during grief, or to simulate the death and resurrection necessary to the shaman. Only in the trance state can there be a communion between man and God. This is almost a universal phenomenon associated with shamanism. Zuni priests chew the root and put powdered root into their eyes in order to commune with the gods that will bring rain. Among the Yumans it allows a man to gain power and predict the future. These belief systems seem to have originated with the Shoshonean Indians of southern California and spread north. They are basically Uto-Aztec, but their practices can be traced through many tribes as far north as the San Joaquin Valley.

Among the Diegño and Luiseño, *Datura* was given only once in a lifetime at the age of puberty. This narcosis was achieved by drinking the powdered *Datura* root in warm water. *Toloache* would stupefy the boy for a period of one to three days, a time that they regard as holy and during which they will have a dream that is special to them, according to the account of Kroeber. Two months after this divine dream, the boys undergo the rite that is to fully separate them from childhood. Symbolically they have undergone a ritual of dying and being reborn that is the common denominator in diverse cultures where ritual use of hallucinogens is prevalent.

In the eastern United States the earliest settlers recorded in 1705 a peculiar ceremony that brought a boy to manhood through the use of *Datura stramonium,* then known as James Town Weed and later jimsonweed. The unfamiliarity of Robert Beverly with the "thorn apple" that turned a group of soldiers into "natural fools" for eleven days would seem to reinforce the belief that this species of *Datura* was of New World origin. The Algonquin tribe of the eastern woodlands used *wysocean, Datura stramonium* root in solution, to keep their initiates into manhood intoxicated for eighteen to twenty days. If at the end of this time they had any recall of the earlier life as a child, a second such ordeal was necessary. A stronger dose would be given if such were necessary, and this would more frequently result in the death of the initiate. In either case, so prolonged a period of trance would require that the boy be given numerous doses of the solution. Resemblances between the eastern and western rites are very strong.

A rhizomatous perennial common throughout moist temperate regions of North America and Europe is the sweet flag, *Acorus calamus* (Fig. 46). Oils found in the thick rhizome have a fragrance reminiscent of patchouli oil, and for that reason are sometimes harvested to be used in perfumes. On both continents it has had a history in medicine as a stomachic and carminative as well as being a palatable vegetable when roasted. Europeans have also been known to candy the sliced rhizome as one would ginger. Hoffer and Osmond reported on Indians who used the

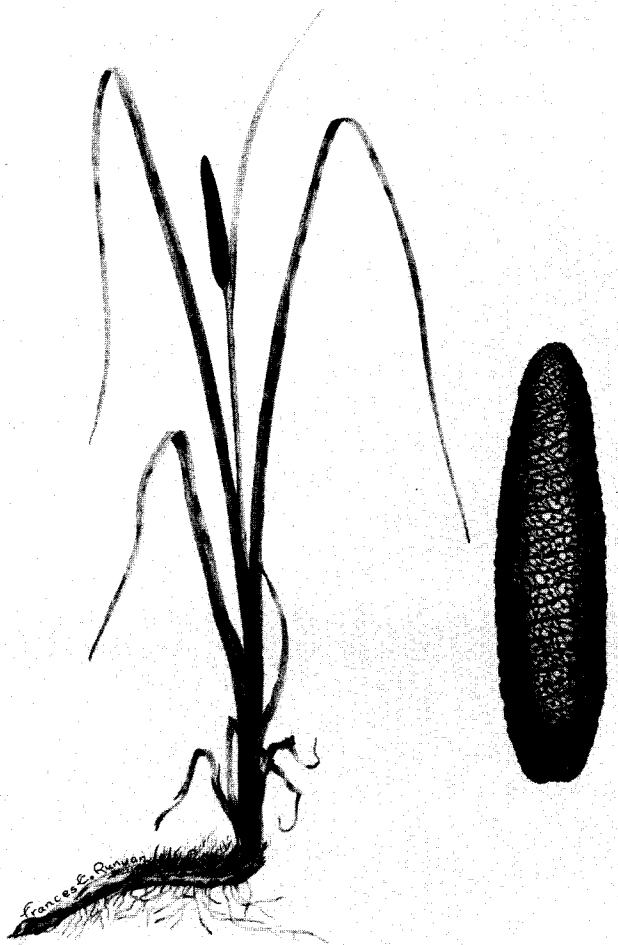


FIG. 46:
Acorus calamus

root to alleviate fatigue on long treks. Some users have described themselves as walking above the ground. Experiments with naive subjects demonstrated an LSD-like experience when they were given the oil expressed from the root. Strong visual hallucinations accompany this experience. Asarone and beta-asarone seem to be responsible for the effects. They do have a chemical structure that suggests mescaline; however, when asarone alone is administered, the psychotomimetic effects have not been demonstrated. Asarone can form tri-methoxy-amphetamine in vivo by amination. This does not happen regularly. The potency of this oil from the rhizome, measured as the quotient of the effective dose of mescaline divided by the effective dose of asarone determined by human titration is eighteen (assuming 3.75 milligrams per kilogram as a base). The Cree Indians of Canada have long used this fragrant rhizome that still eludes the chemist in his attempt to characterize the chemical combinations that create the effects of a hallucinogen.

The ethnobotany of the Hopi, so well documented by Alfred Whiting, makes

mention of a divinatory root belonging to the four o'clock family (Nyctaginaceae). Growing on hillsides at elevations of 2,500 to 6,500 feet in Arizona, *Mirabilis multiflora (Quamoclidon multiflorum)* extends into Utah, Colorado, and north Mexico (Pl. 32). Among the rocks and shrubs, one encounters this spreading plant with bright magenta flowers nestled in dark green foliage. The Hopis used the root for stomach ailments, but a Hopi "medicine man" uses a large amount of *so'ksi* or *so'kya* by chewing on the root. This allows him to make his diagnosis and permits the expulsion of evil spirits in his patient. Chemical analyses are lacking to confirm this alleged intoxication.

MEXICO AND CENTRAL AMERICA

According to a myth of ancient Greece, in Hades there was a river named Lethe, whose waters when drunk induced forgetfulness and oblivion. In the highlands of Mexico, the natives have found a Lethean draught in the foliage of an attractive shrub, *Heimia salicifolia* (Pl. 33). Although the plant has a range that extends north to Mexico and south to northern South America, it is used only in Mexico. An intoxicating beverage *sinicuichi* is prepared by crushing the wilted leaves in water and putting the juice in the sun for about three days to ferment. A cup of this beverage produces a vision that is typically overcast in yellow, and for this reason it is sometimes known by the name "plant of the yellow vision." A mild euphoria overcomes the participant and microscopia (microspia) accompanies the visionary state. Auditory hallucinations are common, and they may consist of sound displacement or the total exclusion of sounds. In this state it is believed that there is a psychic regression to earlier events, and the supernatural effects extend to recollection that goes beyond normal recall. There is apparently no hangover or any other unpleasant side effects. The rather immediate sensation of cold, hypothermia, soon passes. As *herva da vida,* the plant figures prominently in folk medicine in several areas. *Heimia myrtifolia* and *H. syphilitica* are treated as geographical variants of this species and as such probably do not deserve specific rank.

Diaz advanced the suggestion that *sinicuichi* is of Náhuatl origin as it is known also as *sinicuitl,* which may devolve from *xonocuilli* of the Aztecs. No entry under this name is to be found in the Badianus Codex, but the possibility of this being a plant of the Aztecs is certainly intriguing, for *sinicuichi (sinicuil, sinicuiche,* or *sinicuilche)* refers to other narcotic plants such as *Erythrina, Piscidia,* and *Rhynchosia.* The linguistic and ethnobotanical implications should be investigated.

Three investigators have shown the following alkaloids present in *Heimia* leaves: cryogenine (vertine), lythrine, heimine, sinine, lythridine, nesodine, and lyofoline. The most active of these would seem to be cryogenine, which is anti-cholinergic, anti-spasmodic, and tranquilizing. None of these attributes totally characterizes the hallucinogenic state induced by the fermented leaf in water. Experiments have shown additional medical attributes of stabilizing blood pressure and relieving experimentally induced anxiety states. Since the plant is a fairly common ornamental shrub in the southwestern states, its popularity as a legal hallucinogen has grown, and information on it is widely circulated.

"Peyote" is a corruption of the word *peyotl,* which in Náhuatl means silk cocoon or caterpillar's cocoon according to the 1571 *Vocabulario* of Alonso de Molina. The reference doubtless refers to the wooly center and interior of the plants *Lophophora williamsii* and *L. diffusa* (Pl. 34). The earlier species designation of *L. lewinii* as distinct from *L. williamsii* was made by Hennings of the Botanical Museum in Berlin, who treated both as being of the genus *Anhalonium.* Hennings' identification was later regarded as being in error, as he worked with a dried specimen and his identification was taken to be an age variant. Hennings himself had doubts about his ability to make a morphological distinction between the two. However, in 1898 Charles H. Thompson of the Missouri Botanical Gardens grew both species and decided that based upon living specimens, *L. lewinii* was "no more than an unusual form of *L. williamsii. . . .*" More recently, chemical characterizations support the treatment of the genus as being comprised of two variants that may be treated as species or subspecies, *L. williamsii* and *L. diffusa.* The latter, taken to be the ancestral species, may be morphologically distinguished with little difficulty. Indians of Mexico have names for four different variants they are able to distinguish in their own taxonomies. Some botanists would propose these ecotypes as four or five subspecies.

An unfortunate aspect of the use of the term peyote *(peyotl)* is that it is broadly applied in Mexico to diverse genera and species of cacti: *Strombocactus disciformis, Astrophytum asterias, Roseocactus (Ariocarpus) fissuratus,* and *Pelecyphora aselliformis.* That is not to say that all of these species are psychotomimetics, but alkaloids have been found in all but *Strombocactus.* In 1972 I reported on the efficacy of ingested *Pelecyphora aselliformis,* and subsequently it was determined that this species contained small amounts of the active alkaloid mescaline (Pl. 35). To confuse the matter even more, the composite *Cacalia cordiofolia* and the succulent *Dudleya (Cotyledon) caespitosa* are also known as peyote and have no active principles. The importance of Latin binomials is made evident in this excess verbiage created through the use of a common name. There is no doubt, however, that the sacred *peyotl* of the Aztecs was *Lophophora* and that it served as mediator between these people and their gods.

Lophophora is a singularly unimpressive plant appearing as a grey-green knob about the size of a golfball or baseball except for the large taproot, which is most of the plant. Traditional gathering practices involved removing the above-ground portion from the taproot, which would permit cloning and the subsequent emergence of many cacti where there had been only one. Contemporaneous uprooting of these plants threatens to eliminate these two species from their habitats, which would take a sacrament from people who employed this plant in a sacred context before Christianity was known in the New World. After successfully holding out against both religious and legal authority for over four hundred years, it would be a tragedy to deprive these people of a sacrament by rapacious gathering on the part of individuals who do not understand the threat that they pose to the religious and social structure of Indians of North America. Canadian/US use of peyote was not widespread until the end of the nineteenth century. Among the Tarahumara, Cora, and Huichol Indians of Mexico,

the practice is ancient, deriving from the Chichimecas and Toltecs of 300 B.C.

In the mid-sixteenth century, Sahagún, author of the Florentine Codex, spoke of the Teochichimekas (genuine Chichimekas) who knew of *peyotl* and used it to see frightful visions. Their meetings at night were followed the next day by copious tears and the return of reason. Sahagún indicated that these people were given courage by the plant and that they believed that it protected them from danger, hunger, and thirst. He failed to see the religious context. Greater interpretation was given by Francisco Hernández, personal physician to the King of Spain. In his account of 1576 we read: "this root [sic] scarcely issues forth, but conceals itself in the ground as though unwilling to harm those who may discover and eat it." He believed it to be harmful to both men and women, who upon devouring it are able to foresee and predict things. This was, of course, taken to be satanic trickery and deceit that would have to be eliminated to protect the sanctity of the eucharist. It was also necessary to make inquiries about such practices in the confessional. Thus, in *The Road to Heaven* by Father Nicholas de Leon, the priest is to ask the penitent: "Do you suck the blood of others? Do you go about at night to invoke the aid of demons? Have you taken peyotl or given it to others to drink in order to discover secrets or the whereabouts of stolen or lost property?" The eating of peyote was equated with cannibalism, but the pragmatism of the Catholic Church prompted a compromise of sorts so that by the year 1692 the Coahuila Indians had established a mission under the name of *El Santo de Jesus Peyotes,* indicating that the plant was tolerated if not accepted. The plants were brought to the altar of these missions in order to further sanctify them, and the traditions became inextricably enmeshed in most areas. By 1900 Lumholtz documented the Christian elements in the peyote rites among the Huichol. This work was extended by Myerhoff and Furst, resulting in a film that preserves many of the elements that will undoubtedly be lost in a few more decades. The Huichols become the most important link in this tradition in that, as Furst has pointed out, they remained relatively autonomous from colonial military rule and ecclesiastical pressures. As a generalization, one may say that the peoples of Meso-America have preserved more of the elaborate pre-Conquest ritual than have the Indians of North America.

Ceremonies that have developed around the use of peyote are diverse, and yet they have several aspects in common. There is always a fire burning, groups rather than individuals partake of the sacred plant, chanting and singing go on continuously except for a sermon in most North American tribes which ends the ceremony. During the ritual as many as sixty-four "buttons" may be consumed, although the usual number is from four to twelve. The "buttons" are formed by slicing and drying the above-ground portions of the plant. This fibrous slice will dissolve in the mouth, except for the fibers, and is usually swallowed whole. Sometimes these are soaked in water and the liquid is consumed. Chewing the button to break it down is less common. Perhaps the most intriguing mode of use comes from a report given by Timothy Knab to Peter Furst in which Huichol shamans take an infusion of peyote rectally by the use of a deer bladder and a femur bone. Clysters have been used in diverse areas of the world for ritual intoxication involving *Datura, Nicotiana, Anadenanthera, Banisteriopsis,* and *Agave.* The reason is usually to avoid the

physical discomfort of ingesting material that is basically unpleasant. Among the Algonquins the protracted *Datura* intoxication was more easily achieved by maintaining the state through enemas. It would be very difficult to get a person in a trance state to drink without aspiration or other problems, whereas the clyster presents a simple solution. Occasionally fresh peyote juice is consumed when the plant is encountered in the field. Dried or fresh, it is always bitter and astringent, and the initiate is likely to suffer nausea, anorexia, and insomnia as well as feeling a dull headache. Some of these reactions are undoubtedly based upon anxiety.

Culturally conditioned expectations constitute a primary element in the peyote experience. Heinrich Klüver has investigated the syndrome of effects and found that there are certain constants in peyote intoxication that would help to explain behavioral responses that are similar and the convergent themes in interpretations of the experience in unrelated cultures. Klüver's three basic levels are form constants, size and shape constants, and the level of change in spatio-temporal relationships. Regardless of the elaborate detailing of the experience in more personal terms, these themes are reiterated. Mescaline, the primary hallucinogen, is capable of mimicking these constants and the entire experience. Klüver's detailed studies are remarkable in that peyote intoxication is one of the most complex of the psychotomimetic experiences in terms of the range of hallucinations, which include the vivid color alterations, auditory changes, taste and olfactory sensations, macroscopia and microscopia, levitation, tactile hallucinations, time-space alterations, and the experience of "selflessness" or depersonalization. Both Klüver and LaBarre have stressed that the mescaline experience is not the peyote experience.

The Indian participant in the peyote ceremony is shown the Way, the road to the good life, and he enjoys a oneness with his fellow man and with nature. As Lewin reported, he is transported to a new world of sensibility and intelligence. The peyote experience is essentially religious as it is practiced by Indians. Contrary to this we have the hedonistic experience of the European or non-Native American. The account of Havelock Ellis is exemplary: "visions became distinct and green stones, ever changing . . . the air around me seemed flushed with vague perfumes, producing with the visions a delicious effect . . . a kind of removal from earthly cares and the appearance of a purely internal life which excites astonishment." Here we have documentation of an experience that is not considerably different from some of the accounts of hashish eaters and similar also to mushroom intoxication.

Thus, despite constants, the experience is dictated in great part by what the individual brings to it. For the Indians it is a very sacred experience. Contrary to the ethnocentric assertion of Lewin that it "brings the Indian out of his apathy and unconsciously lead[s] him to superior spheres of perception, and he is subjected to the same impressions as the cultivated European . . .," we may say that the understanding of their environment by Native Americans surpasses that of the non-native who seeks to modify it rather than attain a more profound understanding. It is precisely this lack of perception by the non-native that led a group of North American Indians to petition the Supreme Court of the United States in order to preserve their sacrament. This culminated in the founding of the Native Church of North America in which peyote remains as the central sacrament to promote this

contemplative state of introspection and union with God, man, and nature. It permits a return to the principles of a people who have been rightfully disenchanted by a way of life that has been forced upon them by non-natives. No elaborate tests or measurements will reveal the impact that peyote has in these age-old rituals. Even when used as a medicine, it cannot be understood only as a therapeutic agent; peyote remains sacred as a source of life and power. Other mescaline-containing cacti used ritualistically may be found in the section on South America.

Mescaline is a name that was given to the most active alkaloid isolated from *Lophophora* by Heffter in 1894. The choice was perhaps unfortunate in that it derives from the Náhuatl *mexcalli* indicating the *Agave americana* (also called century plant or maguey). From this Aztec word there arose the Mexican term *mezcal* (mescal), designating alcoholic beverages made from several species of *Agave*. Also at a very early date, the practice of putting the red bean-like seeds of *Sophora secundiflora* in *mezcal* to make it more intoxicating was a common practice (Pl. 36). These seeds from the shrubby legume *Sophora* became known as mescal and *mezcal* because of their use as a narcotic adulterant of the alcoholic beverage derived from the *Agave*. The term mescal was adopted by Heffter, because it was in early use to characterize dried slices of peyote, which were "mescal buttons," just as the *Sophora* seeds were "mescal beans." It would seem that the practice of wearing mescal seeds sewn on a peyote leader's vestments would explain the etymological connection. Peyote gradually replaced the mescal bean as the hallucinogen of preference among the people of north Mexico and the United States, because it is less toxic than *Sophora* seeds, which contain cystine. Cystine is a toxic pyrridine that is closely related to nicotine and is found in several other legumes that are used for ritual intoxication. It produces nausea, convulsions, and sometimes death. Evidence for the association between the peyote ritual and the *Sophora* ceremonies may be found on the garments of the peyote leader among the Kiowa Indians. Some of the Plains Indians still consume the bean, but the practice is diminishing. One half of a bean is enough to intoxicate.

Archaeological sites dating before A.D. 1000 suggest a ceremonial use of *Sophora* seed or mescal beans. Among the Plains Indians mescal beans have been used as a divinatory agent to predict, as a vision-inducing agent in initiation rites, and as a stimulant and ritual emetic in other ceremonies. As early as 1539, the Spanish explorer Cabeza de Vaca mentions mescal beans as an article of barter among the Texas Indians, and in 1820 the Stephen Long expedition reported that the Arapaho and Iowa Indians were using the beans as a medicine and a narcotic. Both the Kikapooh and Comanche tribes used an infusion of *Sophora* seed for earache and eye diseases. These magical beans are said to have sexes and to breed. If one puts aside a dozen beans, he should not be surprised to return to this same cache and find several dozen beans. Being magical, they were treated as amulets and when worn, they protected the wearer against bodily harm.

In the spring the Iowas roasted the beans by a fire until the coral orange color turned to yellow. Then the beans were pounded into a yellow meal, and water was added to it. The Iowa red bean ceremony involved a spring purification ritual in which all tribesmen drank this infusion and then vomited copiously. This was a

form of *limpia* or ritual cleansing that may be found throughout the Americas. It is more than ridding the body of toxins, it is a symbolic and physical purification brought about by a sacred agent.

Frijolitos, or *Sophora* seeds, have often been confused with the seed of *Erythrina flabelliformis* and related species in this genus (Pl. 37). Although the trees are quite distinct, the seeds bear a superficial resemblance to each other. In Mexican markets both seeds may be found for sale, the former as *frijolitos* and the latter as *colorines.* While *Erythrina* occurs in the tropics and subtropics of both the Old and New worlds, not all species contain indole or isoquinoline derivatives that present a potential for hallucination. The tetracyclic ring known as erythran is common to those that are psychoactive, and the effect seems to be predominantly that which is elicited by curare toxins that are used as tropical arrow poisons.

Were it not for the absence of black, this seed might be confused with yet another member of the pea family, *Rynchosia.* Two species of this genus are in common employ on the slopes of Popocatepetl, *R. pyramidalis (R. phaseolides)* and *R. longiraceomosa* (Fig. 47). There is considerable antiquity in the practice of using this seed as a narcotic, for it figures prominently in some Aztec paintings together with hallucinogenic mushrooms. In the Tepantitia fresco (c. A.D. 300–400), *Rynchosia* seed may be seen falling from the hand of the rain god, Tlaloc. The name by which this seed is best known, *piule,* is also used to indicate all of the hallucinogenic morning glory seeds (*Ipomoea* spp.). The narcotic in these red and black beans is as yet unidentified, but physiological testing has shown the effects to be like those of curare, further linking this seed to *Erythrina.*

Spaniards have never been fanciers of mushrooms, so it is easy to understand their disgust when, as Christian conquerors, they found the Aztecs using mushrooms as a sacrament under the name *teonanacatl* or "God's flesh." Sahagún, being a sixteenth-century Spanish friar, and the king's physician Hernández gave written accounts of loathsome mushroom rituals that "provoke lust . . . cause not death, but madness . . . and bring before the eyes wars and the likeness of demons." Sahagún included in his denunciation some drawings of these pernicious fungi and the devil inspiring them. Needless to say, *teonanacatl* was banned by the church as contributing to pagan behavior and idolatry. It was particularly irksome to the conquerors that these mushrooms should be used in a sort of communion ritual. On state occasions, such as the coronation of Montezuma in 1502, hallucinogenic mushrooms were incorporated into the feast.

The practice of venerating mushrooms dates back to around 100 B.C. and is based in part upon the discovery of nine miniature mushroom stones found in a late pre-Classic to early Classic site near Guatemala City. Progressive finds ranging from Vera Cruz in the north to El Salvador and Honduras in the south have indicated an extensive mushroom cult in very early civilizations. Nineteenth-century stones were interpreted as vestiges of phallic worship. This concept was not discarded until the end of the nineteenth century, when more finds established the nature of the idols as mushrooms. Frequently these were associated with a young woman leaning over a *metate* and grinding mushrooms, or there was an association with the toad *(Bufo marinus),* whose skin contains the narcotic bufotenine (Fig. 48).

FIG. 47: *Rhynchosia longiraceomosa*

FIG. 48: Guatemalan mushroom stone and girl with a metate

It was not until 1936 that a non-Indian, Roberto J. Weitlaner, witnessed the holy rites involving *teonanacatl.* During the years 1938–39 Richard Schultes, then beginning his career as an ethnobotanist, was doing field work in the area of Oaxaca and sent specimens of the sacred mushrooms back to Harvard. Many years later they were to be identified as *Psilocybe caerulescens* var. *mazatecorum, Panaeolus companulatus* var. *sphinctrinus* and *Stropharia (Psilocybe) cubensis* (Pl. 38).

During several successive trips beginning in 1953, R. Gordon Wasson explored the area of Oaxaca and environs searching for fragments of this intriguing and incomplete puzzle. As he was a devoted amateur schooled in mycology, Wasson enlisted the aid of Roger Heim, the world-famous expert on fungi from Paris, and the chemist-naturalist Albert Hofmann of Sandoz Laboratories in Basel, Switzerland. Wasson wrote several important articles on their experiences as participants in mushroom ceremonies among the Mazatecs and recorded these on tape and film. In addition to enlarging the number of known species used, they described frescos depicting mushroom worship going back to A.D. 300 and mushroom stones from Guatemala dating to perhaps 1000 B.C. Their fungal finds included: *Conocybe siliginoides* from dead tree trunks, *Psilocybe mexicana* from wet meadows and pasturelands, *Psilocybe aztecorum* growing in moist fields, *Psilocybe zapotecorum,* known as "crown of thorns" and indigenous in marshlands, *Psilocybe caerulescens* var. *mazatecorum* which grows on refuse, *Psilocybe caerulescens* var. *nigripes*

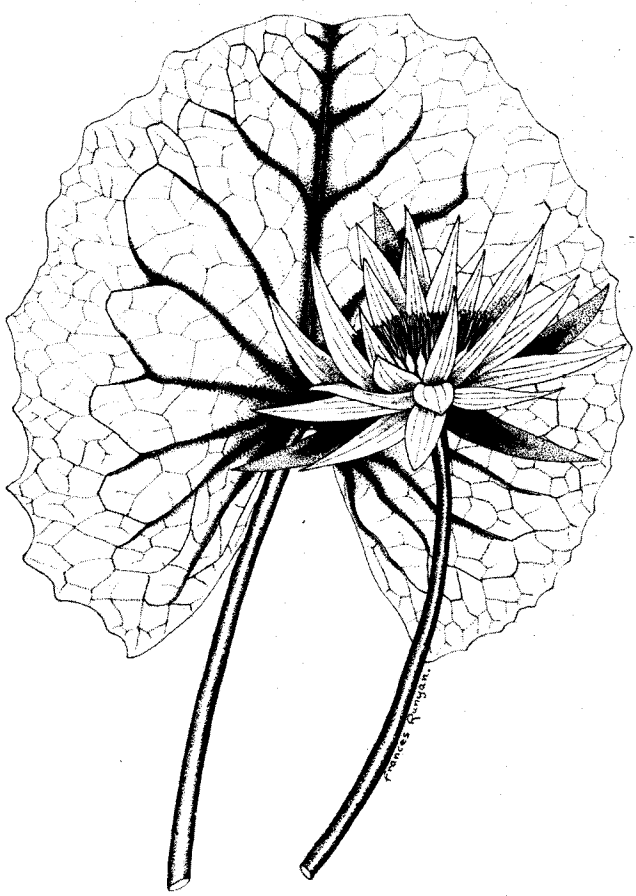


FIG. 49:
Nymphaea ampla

called the "mushroom of superior reason," and *Stropharia (Psilocybe) cubensis,* which is often found on decaying plant material.

While mushrooms were doubtless consumed in rituals over much of Mexico and Central America in ancient times, the only tribe definitely known to have used *teonanacatl* is the Chichimecas. In Oaxaca today, six tribes consume sacred mushrooms: Mazatecs, Chinantecs, Chatinos, Zapotecs, Mixtecs, and Mijes. Other tribes using the sacred mushrooms are the Nahoas of Mexico, the Tarascans of Michoacan, and the Otomis of Puebla. More recently it has been suggested that the use of the mushrooms in a ritual fashion by the Chol and Lacandón Maya may be a vestige of an earlier Mayan ritual that may have disappeared for a time and then been readopted. Although most authorities on Mayan civilizations have in the past spoken only of tobacco as an intoxicant, recent studies by Robertson in 1972 have documented the use of mushrooms by Lacandón priests within the seclusion of

small temples at Yaxchilán. This, combined with evidence presented by Dobkin de Rios in 1972 and 1974 on hallucinogenic water lilies *(Nymphaea ampla)* and narcotic toad skins, suggests that the structure of Mayan civilization may require new interpretations (Fig. 49). Peter Furst in 1972 did much to put the role of mushrooms and the toad into an Aztec cosmology, and in the subsequent two ensuing years this anthropologist identified a number of mushroom effigies in ceramic pieces of tombs of west Mexico some two thousand years ago. The burgeoning reports in recent times suggest that much of the history of the peoples of ancient middle America will have to be rewritten in light of the prevalence of psychoactive plant and animal material that was previously unknown in the psychohistory of these civilizations.

The Sandoz Laboratories of Switzerland were successful in 1958 in isolating psilocybin and psilocin from *Psilocybe mexicana*, and subsequently these were found to be the active principles of the various genera comprising "magic mushrooms." Psilocin is 1.4 times as potent as psilocybin. Hofmann and his colleagues found qualitative similarities between the effects of these mushrooms and LSD or mescaline reactions. They believe that psilocybin and LSD create similar psychic manifestations by acting on some common mechanism. It is to be noted that the amount of psilocybin and psilocin in *Psilocybe cubensis* is considerably higher than in other species. Hofmann's reported vivid hallucinations with thirty-two specimens of dried *Psilocybe mexicana* are easily achieved by using three or four dried *P. cubensis* specimens. The period of intoxication is approximately four hours.

Effects of psilocybin and psilocin include colored hallucinations, muscular relaxation, occasional hilarity, inability to concentrate one's attention, alteration of time and space perception, and a feeling of isolation from one's environment. The sensation of a new reality has passed, the body is in a state of physical and mental lassitude. Some investigators report depression upon leaving the intoxicated state. I believe that this relates directly to the quality of the experience, for the new vistas, levitation, and personal revelation can be exhilerating even in a state of physical exhaustion. The experience varies from one time to another in the same individual, and most certainly from person to person. As with LSD, these mushrooms should be useful in experimental psychiatry. They are pleasant to consume and produce no offensive toxic reactions such as vomiting or vertigo. The intoxication is not a stupor, but a period of a new consciousness and a new reality. These are sensations that have been experienced in sacred ceremonies that have been conducted in Mexico and Central America for centuries or perhaps even millennia.

Present-day ritual among Mazatec curanderos involves the incorporation of a great deal of ritual from the Catholic Church, which tried without success to eliminate the detested fungi. Chanting to the saints of the church and the incorporation of litanies are undoubtedly post-Christian elements in Mazatec ritual. It is difficult to separate out those ritual and musical elements that are authentic. The beating of arms against the rib cage and thighs as well as the clapping of hands during the ceremony establish a music over which chanting and singing are heard. During the trance the mushroom speaks through the curandera and she, appropri-

ately, speaks in the several voices of the persons she has become. A parish priest in 1629 recorded a list of the word formulas employed by the Aztecs in a mushroom invocation. This record reveals nine personages for the individual conducting the ceremony, a style now paralleled in the Mazatec curandera's mushroom ceremony.

Oaxaca has, perhaps, more knowledge of mind-altering plants per square mile than any other region of the world, and yet the Indians of Oaxaca have uses for local plant species that may not extend beyond a given tribe even though the plant may be ubiquitous. Such is the case with two bizarre puff-balls *Lycoperdon marginatum* and *L. mixtecorum* (Figs. 50 and 51). More than one hundred species of this genus may be found in the temperate forests at high altitudes. The Mixtecs, living at an altitude of about two thousand meters and above, collect the two aforementioned species, which upon ingestion create a semi-somnolent state in which voices and echos are heard. Mixtecs believe that if they listen to the voices they may expect answers to the questions posed. These puff-balls differ from the magic mushrooms in that the hallucinations may be purely auditory and without visual content. *Lycoperdon mixtecorum*, known as *gi-i-wa* (fungus of the first quality), is the preferred of these two fungi. *Lycoperdon marginatum*, or *gi-i-sa-wa* (mushroom of the second order), has a decided odor of fecal matter. One would expect the nearby Mazatecs to utilize one or both of these as surrogates for their mushroom rituals, but they apparently do not have the regard for *Lycoperdon* exhibited by the Mixtecs. Other *Lycoperdon* species are used by Brujos among the Tarahumara for evil purposes. A report made early in this century by Chestnut, who worked among the Indians of Mendocino County in California, indicated that *Lycoperdon* was a plant important to the shamans of this area in working their magic. Also, we have mention made by H. W. Ravenel in 1869, "It has been mentioned by medical writers that the spores of the puffballs have narcotic properties, and it is an anaesthetic agent, acting somewhat like chloroform when inhaled." Ravenel reported that a colleague in South Carolina made several meals on *Lycoperdon* and exhibited well-marked evidences of narcosis. This was corroborated by two of his friends. In Canada *Lycoperdon pyriforme* was used to arrest sleep! A thorough assay of this intriguing genus in all geographical areas is in order. One of the most bizarre uses for a puff-ball is the burning of dried *Calvatia lilancina* (Lycoperdales) near hives and honey sources to intoxicate bees without killing them.

The Mazatecs may select an exotic naturalized plant while disregarding an indigenous plant that they know to be psychoactive. *Coleus* species all came to America from the Old World tropics. *Coleus pumila* and *C. blumei* are both native to southeast Asia and are reported to have found favor among the Mazatecs as vision-provoking plants (Pl. 39). These members of the mint family are common in most ornamental gardens throughout the world because of their highly colored and showy foliage. Among the Mazatecs, *Coleus pumila* is called *el macho*, or the male, and *C. blumei* is called *el nene*, or child, and also *el ahijado*, the godson. Psychotropic effects have not been able to be substantiated by testing, nor has any psychoactive compound been isolated from either species. We have only the reports of R. G. Wasson, which were unable to be verified by J. L. Diaz in his excursions into the Sierra Mazateca.

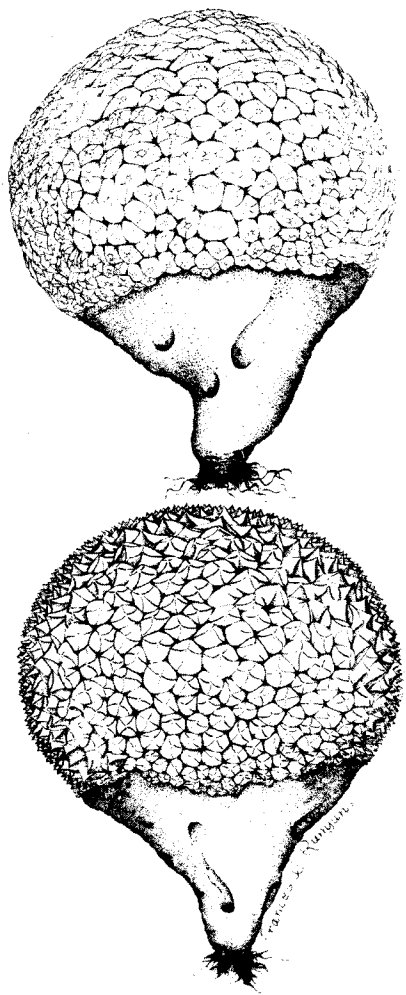


FIG. 50 & 51:
Lycoperdon mixtecorum
Lycoperdon marginatum (bottom

The foregoing report would be more disconcerting were it not for another member of the mint family used as a divinatory among the Mazatecs for which there is no chemical substantiation. *Salvia divinorum*, or the sage of the seers, is found growing only in the forest ravines of northeastern Oaxaca (Pl. 40). The plant propagates itself by the decumbent branches falling to the ground and rooting. It seems, however, to be in cultivation and to be absent in areas where it is not under the care of man. The material sent by Wasson to Carl Epling at the University of California at Los Angeles in 1962 was improperly described as having deep-blue flowers that were slightly pubescent and a bluish calyx. Having grown this plant for

over ten years, I have brought it into flower on several occasions, and it is necessary to amend the description. The plant flowers only when the branches are about seven or more feet in length, at which time it is sprawling. The leaves are an almost iridescent green, and the stems are quadrangular with wings that are crenate. It is in all aspects herbaceous. The flowers are pure white and densely tomentose. They are borne in a violet calyx tube and do not set seed even when pollinated. The entire panicle is of a violet color contrasting sharply with the white, sigmoid corollas that protrude from the tube and are up to thirty millimeters in length.

This spectacular member of the mint family is known to the Mazatecs as *hojas de la Pastora* or *hojas de la Maria Pastora* (leaves of the Shepherdess or leaves of Mary the Shepherdess). Wasson became interested in this plant when investigating an herb called by Sahagún *poyomatli* which Juan de Cárdenas wrote of as *poyomate.* This was one of the plants associated with hallucinations and magic by Beltrán in his book *Medicine and Magic.* Although the records in Colonial Mexico indicate that the divine plant was used in all of its parts (with the exception of the seed, which goes unmentioned), contemporary Mazatecs use only an infusion of the leaves that have been ground in a metate. The extremely bitter green liquid often induces vomiting, after which visual hallucinations include vivid patterns of color that seem to be in constant motion. These visions come quickly upon drinking the infusion and last only for a brief time. Curanderas have chants appropriate to the use of *Salvia divinorum,* but they have another such ceremony when this sage is used with psychotomimetic mushrooms. These two ritual incantations and ceremonies parallel each other.

As many as one hundred crushed leaves in water may be given to a sick person by a curandera, and in about fifteen minutes the ailing person will be in a trance-like state and able to recite the cause of his illness. The same plant liquid is used to disclose theft or evil doing among villagers. This practice extends beyond Mazatec territory into the contiguous Cuicatec and Chinantec areas. Plants of *Salvia divinorum* are maintained in these areas by asexual propagation. Shoots are broken from the mother plant and inserted into the rich soil along stream beds where they quickly root. When gathering the plant for ritual use, Indians avoid those plants that have been attacked by snails and various caterpillars, for these would be inappropriate for use in ceremonies associated with prayers to the Virgin Mary, who is the patroness of this plant. Sometimes the leaves are not ground in a metate, but are nibbled in pairs using the incisor teeth. The precise ritual seems yet quite vague, for the Mazatecs are reluctant to reveal such information.

If indeed the plant of the Aztecs, *pipiltzintzintli,* is *Salvia divinorum,* it represents one of the foremost ethnobotanical discoveries of this century for reason of both plant and ceremonies attendant with it having eluded anthropologists and botanists for such a long time. Although chemical investigations in several laboratories have been conducted for over a decade, the active components remain uncharacterized. Physiological testing on animals reveals the assertions regarding the psychoactive character of the leaves to be true. A mild euphoria and vertigo generally follow the initial visual phase of intoxication. Some experimenters have indicated a period of weightlessness during the first critical intoxication in which

dancing colors are in evidence. The extreme bitterness of the leaves will probably preclude it from becoming a popular hallucinogen in newer drug subcultures.

Snake plant or *coaxhuitl* was the vine Aztecs used to obtain a small cache of seeds known as *ololiuqui*. Growing as a tall shrub bearing white tubular flowers in great pendant panicles, it was first described and illustrated by Hernández, who wrote of it between 1570 and 1575. A Spanish record of 1629 reported that the seed in an infusion deprives a man of his senses and is very powerful. Those who used it were said to have communion with the devil, to believe in the owl, and to suck blood. Their deity resides in these seeds with which they become intoxicated and commune with the devil, according to this account. Seeds of *coaxhuitl* were venerated and placed in ancestor figures. It is no wonder that priests worked diligently to eradicate the practice which they interpreted as communion with the devil as well as elements in diabolical magic. There is further evidence that *ololiuqui* was mixed with tobacco and venomous insects that had been burned in order to make a mixture that could be rubbed on the bodies of priests to induce what was interpreted as a satanic delirium. After several centuries of neglect, the issue was taken up and the plant was variously identified as *Datura* and other members of that family (Solanaceae).

In 1897 Urbina made the suggestion that *coaxhuitl* was *Ipomoea sidaefolia*, a plant that we would now call *Rivea corymbosa* (Fig. 52). In 1939 Reko, who had accepted this identification, united with Schultes to collect botanical specimens of a plant being used in ritual divination by a Zapotec witch doctor in northeastern Oaxaca. It was found that the plant of the Aztecs, now widely used throughout Oaxaca, was indeed *Rivea corymbosa* of the morning glory family. In 1937 Santesson had reported a narcosis in mice and frogs using seed of *Rivea corymbosa*. This was followed by some daring investigators experimenting on themselves with results that varied from reports of increased visual sensitivity and listlessness to reports of no discernible effects after the consumption of as many as 125 seeds. Hofmann in 1960 uncovered the secret of the *ololiuqui* seeds. They contained amides of lysergic acid that are characteristic of those found in the European fungus *Claviceps purpurea* as well as *Penicillium* and *Rhizopus*. Delta lysergic acid amide (ergine), d-isolysergic acid amide (isoergine), chanoclavine, lysergol, and elymoclavine were found. The establishment of *Rivea corymbosa* as both a hallucinogen and as the plant of the ancient Aztecs was ascertained.

A further study of Zapotec ethnobotany by MacDougall in 1960 revealed that yet another type of morning glory was being employed in the same way as *Rivea*. The vine *Ipomoea violacea (c.f. I. tricolor)* produces small black-pointed seeds in the confines of a papery-thin tan capsule (Pls. 41 & 42). These *badoh negro* seeds were suggested by Wasson to be the *tlitliltzin* of the Aztecs. The Zapotecs grind seeds of both *Rivea* and *Ipomoea* together in a metate, wrapping the meal in a cloth sack and soaking it in cold water. The resulting infusion provided the curandera with information about the illness of a patient, a troublemaker among her people, or the location of a lost object. This is certainly a devolvement from the magico-divinatory rites of the Aztecs. The use of LSD-25 (d-lysergic acid diethylamide) as a

FIG. 52:
Rivea corymbosa

recreational drug and in therapy is in a direct lineage with these magical seeds. Characteristic visions of the "little people" are common to those who use morning glory seeds, a condition that we would refer to as microscopia and which accounts for the prevalent reports of elves, leprechauns, gnomes, hombrecitos, and all of the other tiny people that fill folk tales throughout the world. Many hallucinogens are capable of producing this effect, and one may expect one day to read a treatise on the chemical basis of numerous and diverse folk tales.

Cultigens, which are varieties of *Ipomoea violacea*, have attained a considerable popularity in continental United States because of their psychoactive properties. Among these are: Heavenly Blue, Pearly Gates, Flying Saucers, Wedding Bells, Summer Skies, and Blue Star. All contain amides of lysergic acid, and the effects are reported to be like those of a mild LSD experience. Recently, several major suppliers of these seeds have been dusting them with a noxious chemical fungicide prior to sale in order to discourage consumption by an experimental minority. Although warnings are placed on the packages, it would seem to be a slight deterrant to those

who wish to use the seeds, for in a few months enormous amounts of these seeds can be produced by growing the plant in any sunny spot. Attempts to place controls on the seeds have been abortive.

Controversy continues over the use of *Argemone mexicana* among the Indians of Sonora, Sinaloa, and Baja California. In a book entitled *Magical Poisons* published in Stuttgart in 1949, V. A. Reko mentioned Chinese living in Mexico using a "chicalote opium," which was reputedly derived from capsules of a hybrid between the opium poppy and the native *Argemone mexicana* or prickly poppy (Pl. 43). This seemed so unlikely that Varro Tyler, Walter Naumann, and Frank Vincenzi undertook an extensive study in which they attempted to hybridize these two genera. No seeds were obtained in repeated attempts at hybridization, and one may assume that the Reko conjecture was mistaken with respect to an opium-producing hybrid. However, the seeds of the prickly poppy are used as a narcotic in several areas of northern Mexico, and they do contain several isoquinolines, the basic skeleton of which is common to the mescaline-containing cactus *Lophophora* and the opium poppy *Papaver somniferum*. Earlier reports of morphine being isolated from *Argemone* are to be discounted, as they have not been substantiated. Protopine, found in *Papaver somniferum*, and berberine are both alkaloids of *Argemone mexicana*. While the hybrid theory may be laid to rest, the possibilities of *Argemone* seeds being psychoactive are worthy of further consideration. The oils are still regularly used in emesis, and the ritual of *limpia*, which involves inward cleansing in itself, induces a sort of euphoria.

The uses of *Datura inoxia* and related species in Mexico closely parallel those of the Zuñi Indians of the southwestern United States, and to a lesser degree the Algonquins of northeastern America, who knew the herb as *wysocean*. These parallels have already been touched upon. A most eloquent documentation of the ritual use of *Datura* among the Yaquis was made by Carlos Castenada in *The Teachings of Don Juan*. In this controversial book we learn that it is the herb that permits man to fly from place to place like a bird. The philosophy attendant with *Datura* use is most profound and cannot be reduced to a few elementary statements. A major difference between the Yaqui traditions and those practiced by Indians of the southwestern United States is the growing of one's own herb and the elaborate preparation and the rituals that accompany its use. It may be said that the shamanic tradition is generally stronger in Mexico and Central America and reaches a high point in diversity and complexity in South America. The native manipulation of plants by hybridization in Mexico makes the task of the taxonomist trying to identify species a sort of nightmare. It is convincing testimony to the involvement of man with this potent narcotic plant.

In his *Flora of Malaysia*, Burkhiil reported that the labiate *Leonorus sibiricus*, commonly known as motherwort, was smoked in Malaya when *Cannabis indica* was not available (Fig. 53). This practice he traced to at least 1918 by way of his informant Boorsma. In 1976 Jose Diaz reported on this perennial mint under the name of *marihuanilla*. Diaz gives an account of this Siberian and Mongolian introduction finding acceptance in the state of Chiapas and surrounding areas. Three villages of Chiapas are especially involved in the use of the plant, both as a

psychotropic and in a tincture to treat rheumatic fever. The popularity of *marihuanilla* will doubtless increase as the pressure from local and federal authorities in Mexico to ban the use of *Cannabis* increases. The three alkaloids extracted to date are leonurine, leonuridine, and homorunine, which are suspected to cause the psychotropic effects. A related species, *Leonorus cardica,* of Europe and Asia has long been used in medicine as a nervine and to quiet hysteria under the name of common motherwort. It would seem that the entire genus merits further botanical and chemical inquiry.

In his book on *The Medicinal Plants of Mexico,* Martinez in 1945 referred to *Tagetes lucida,* a native marigold, as "narcotic and toxic" (Pl. 44). A number of reports have come out of Huichol territory indicating that the leaves of this plant are smoked to produce a period of tranquility. Other Huichols have indicated that the plant produces visions similar to those induced by *Lophophora williamsii. Tagetes lucida* is also known under the names *tumutsali* or *yauhtli. Yauhtli* was a plant sacred to the Aztecs and also known under the names *yyauhtli, yyahitlm, yyahhitl;* the script in the Badianus Codex is obscure. Sahagún mentions the plant in several early contexts, and one is very shamanic in content. *Tagetes lucida* was the bright yellow flowered herb whose leaves were possessed of much oil and great fragrance. Powdered leaves were thrown in the faces of captives to be sacrificed to the fire god *Xiuhtecutli (Huehueteotl)* during the festival of *Xocothuetzi,* the tenth

FIG. 53: *Leonorus sibiricus*

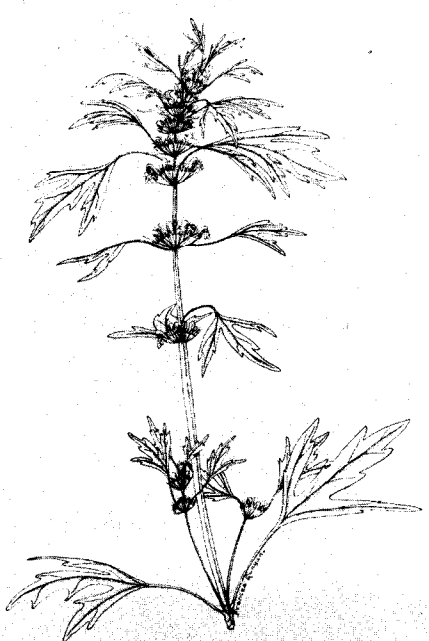
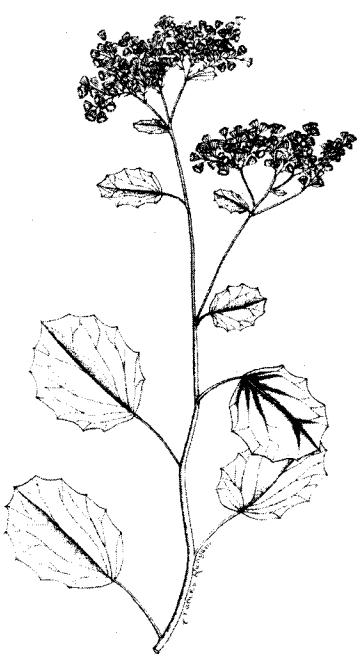


FIG. 54: *Senecio hartwegii*



month of the Aztec calendar year. This was done presumably to deaden the senses of the victims.

Tagetes lucida has long been used in ritual purification for cleansing the air. In a religious context it is often referred to now as the herb of the Virgin Mary. The fragrance is somewhat akin to licorice and chocolate. In the court of Montezuma it was one of the additives to his ritual drink of cacao. It is difficult to affirm or deny the reports of this plant as a narcotic in that they are so highly varied and chemical analyses are incomplete. The data, however, is not significantly different from that on nutmeg in terms of the erratic mode of action conditioned by oils present. In any event, the reports are too numerous in favor of *Tagetes lucida* as a Huichol narcotic to deny the worth of continuing chemical and ethnobotanical inquiry.

In the Badianus Codex the plant figured in plate 46 is labeled *ytzcuinpahtli*, which translates as dog medicine and has been identified as *Senecio canicida*. Ramirez in his Materia Medica of Mexico refers to the plant as *itzcuimpatli* and by the Spanish name *yerba de la puebla*. His identification is also *S. canicida*. Flores in 1886 in writing of a history of medicine in Mexico referred to this very same plant and stated it to be a narcotic. In the Badianus Codex it was a principal ingredient in a medicine used to relieve pain in the chest. Vélez in 1897 concurred with the earlier judgement of Flores and conducted a series of experiments with animals in which the extract of various species of *Senecio* from Mexico were administered as senecio-toxin in the form of crystalline alkaloid put into solution. This provoked a period of excitation followed by irritability, and ultimately death ensued after a partial paralysis. He noted that in humans the use of *Senecio* caused a period of excitement followed by delirium.

Senecios were included in that broad group of plants called peyote or *peyotl*. In describing the *peyotl* of Xochimilco and of the Zacatecs, Hernandez makes it clear that the plant he is referring to is not the cactus *Lophophora*, but *Senecio*, probably *S. hartwegii* (Fig. 54). This latter species is known also as Peyote of Tepic. Most of these senecios have been found to have psychotropic chemicals of a necine structure best characterized as neurotoxin. *Senecio* is also the identification made of some of the peyotes of the Tarahumara. We now need to know the exact role of the *Senecios* in induced psychoses. The material is not suitable for human experimentation, however, since it contains several chemicals that function as liver toxins and are extremely dangerous. Recent focus has been upon using this plant to arrest certain forms of cancer. Species of *Senecio* known to have been used for some ritual or medical purpose in Mexico include: *S. grayanus*, *S. cervarifolius*, *S. praecox*, *S. tolucanus*, *S. hartwegii*, and *S. canicida*.

The use of the plant *Canavalia maritima* by sailors around the Gulf of Mexico was reported by Jose Diaz (Fig. 55). This legume is reported to be a substitute for marihuana as a recreational drug for which there appear to be no antecedent uses that can be documented. *Canavalia* seeds have been found in Oaxaca and the Yucatan dating from 300 B.C. to A.D. 900, and in Peruvian burial sites. In contemporaneous use it has been reported to be useful against the evil eye. When employed as a narcotic, it is not the seeds that are used, but the fruit or pod that is dried and then ground into a material that is suitable for smoking. As a comestible the beans are

FIG. 55:
Canavalia maritima

inferior to *Phaseolus*, and given the ancient cultivation of both, it is not unreasonable to suppose that the cultivation of *Canavalia maritima* may have been for reasons of its efficacy as a psychoactive material. Analyses show the presence of l-betonicine, an alkaloid also found in the genus *Achillea* and in two genera of the mint family, *Stachys* and *Betonia*. It would seem that this alkaloid is working in tandem with others, as it has not been demonstrated that betonicine is in itself psychotropic. Its popularity as a recreational drug merits further investigation of not only the chemistry but also the possible antiquity of use. Was it a comestible or a psychotomimetic? Perhaps it served dual purposes. We know that *Canavalia ensiformis*, the jack bean, is used when immature in the West Indies where the unripe pod is consumed. The seeds of this same pod are toxic when immature and when mature may be roasted and used as a coffee substitute. *Canavalia polystachya*, used in China, India, Arabia, and Africa, is eaten in its entirety, that is, both

seed and pod, when unripe. The ripe seed of this species is poisonous. We have no similar record of using the seed or fruit of either of these other two species in a manner similar to that of *C. maritima* in Mexico, and a comprehensive survey of this fascinating legume in all of its uses remains to be accomplished.

SOUTH AMERICA

Since the voyage of that remarkable ethnobotanist Richard Spruce to the Amazon and Andes during the years 1849 to 1864, ethnobotanists have journeyed to the Amazon in order to study the plants and the people. Wallace's edited notes of Spruce appeared in two volumes under the imprint of the Macmillan Company in 1908 and are essential reading for anyone who would attempt to penetrate this area in an anthropological or ethnobotanical foray. A more eloquent ethnobotanical chronicle for this vast area has yet to appear.

Most investigators since the expedition of Spruce have found a few weeks to attempt to add to the information that this famous botanist presented. One notable exception is Professor Richard Evans Schultes, Director of the Botanical Museum of Harvard University. Schultes has spent seventeen years studying in the Amazon and has lived among its people for extended periods of time during which he has presented ethnobotanists with a flood of papers that have added much to our knowledge of psychoactive plants of the area and the context of their use, and he has given us new genera and species that were formerly unknown in a ritual context. The acculturization of aboriginal peoples is taking place at an ever-increasing rate, and the destruction of indigenous vegetation in the tropics is being lost to slash-burn techniques of agriculture. The valuable phytological lore that would have otherwise been lost, and the traditions that are as perishable have been recorded by Richard Schultes and a number of his students. The legacy of the intrepid botanist Richard Spruce has been passed on to his legitimate heir.

In his *Notes of a Botanist on the Amazon and Andes,* Spruce devotes chapter twenty-five to narcotics and stimulants. What is so laudable about the approach of this gentleman from Yorkshire is that instead of viewing with horror the practices so vastly different from anything that he had previously known, he records events with fascination. His drawings of people and places are quite accomplished. It must have shocked many of his readers to find Spruce in accord with the medicine of the Amazon: "the domestic medicine of the South American Indians is chiefly hygienic, as such medicine ought to be, it being of greater daily importance to preserve health than to cure disease." He further noted that if the physicians of these people were sometimes lacking in skill, their methods were still far less dangerous than the practices of Western medicine as portrayed by Lesage and Molière. The warm sympathies of this great man opened doors to him that were closed to the judgemental Portugese missionaries, who saw the devil in every sacred act of these people.

Of all psychotropic plants in the Amazon, perhaps none is more interesting than the liana which Spruce found and described under the name *Banisteria caapi (Banisteriopsis caapi)* in 1853 (Pl. 45). This he included under the heading "On

some remarkable Narcotics of the Amazon Valley and Orinoco" and remarked on his good fortune of not only being able to see this famous narcotic in use, but to record its botanical features. *Ayahuasca* or dead man's vine was the name given to the plant in Ecuador, *caapi* in Brazil and Venezuela, and *cadána* by the Tucáno Indians on the Vaupés. Spruce noted that the lower part of the stem of this woody vine was stripped away and beaten in a mortar with the roots of *Haemadictyon amazonicum* and water. After being sufficiently triturated, the brew was passed through a sieve into a bowl and enough water was added to it to make it potable (Fig. 56). The color at that point was brownish-green and the flavor quite bitter and disagreeable.

It was November of 1852 when Spruce found himself an honored guest at a Dabocurí, or Feast of Gifts, given in the village of Panuré in a house known as the turkey-buzzard's nest. He writes of his nocturnal arrival just as the lugubrious sound of the sacred trumpets began to boom heavily and the women, under penalty of death, scurried to hide. Some three hundred men assembled and dances commenced. Five or six times in intervals between the dances, young initiates would drink *caapi* from the gourd of the cupbearer.

> *The cupbearer . . . starts at a short run from the opposite end of the house with a small calabash containing about a teacupful of* caapi *in each hand, muttering "*Mo-mo-mo-mo-mo*" as he runs, and gradually sinking down until at last his chin nearly touches his knees, when he reaches out one of his cups to the man who stands ready to receive it, and when that is drunk off, then the other cup.*
>
> *In two minutes or less after drinking it, its effects begin to be apparent. The Indian turns deadly pale, trembles in every limb, and horror is in his aspect. Suddenly contrary symptoms succeed; he bursts into a perspiration and seems possessed with reckless fury, seizes whatever arms are at hand, his murucu, bow and arrows, or cutlass, and rushes to the doorway, where he inflicts violent blows on the ground or the doorposts, calling out all the while, "Thus would I do to mine enemy (naming him by his name) were this he!" In about ten minutes the excitement has passed off, and the Indian grows calm, but perhaps exhausted. Were he at home in his hut, he would sleep off the remaining fumes, but now he must shake off his drowsiness by renewing the dance.*

The character of Spruce was that of an abstemious man, and it was with no great pleasure that he was obliged to "dispatch" a cup of the "nauseous beverage" himself followed by a gourd full of Manihot root beer, which he took with "secret loathing." Were that not enough, he was then given a cigar two feet long and as full as his wrist, followed by a cup of palm wine. He retired to a hammock with a cup of coffee and "the strong inclination to vomit." One must admire his stamina and endurance given his naturally delicate nature, which he constantly overcame in his Amazon and Andean expedition. It is noteworthy that Spruce indicated seeing vines under cultivation at this time. Only a few years later the explorer Villavicencio, writing on the geography of Ecuador, encountered the Zaparo, Angatero, and Mazan of the

FIG. 56:
Bowl used for ayahuasca

Ecuadorian Amazon using a similar decoction in order to deliberate on matters of war and love, to learn the source of spells, to divine truth, and to see into the future. While the published report of Villavicencio predates that of Spruce, it lacks the astute observations of the latter. As a botanical explorer, Spruce made careful and useful notes as well as collecting specimens. When he later visited the Zaparo, he correctly identified the plant which to Villavicencio was only a vine of some unidentified sort. A plethora of similar vagaries appeared from subsequent explorers who could say little more than "*auyahuasca, caapi,* and *yajé* are brewed from a jungle vine."

Banisteriopsis brews are known by a variety of names according to the area's dialects as well as by the nature of the brew; many admixtures have been recorded since the first note of *Haemadictyon amazonicum* (now properly recorded as

FIG. 57: *Psychotria viridis*

Prestonia amazonica). What was formerly believed to have been brewed from a single species, *B. caapi* is now known to be derived from three additional species: *B. inebrians, B. rusbyana,* and *B. quitensis. Ayahuasqueros,* or those who use this beverage, are to be found in the Amazon basin of Brazil, Bolivia, Colombia, Ecuador, and Peru, as well as in the Orinoco of Venezuela and the Pacific coast of Colombia.

In the northwest Amazon, *caapi* is used as a hallucinogenic snuff, and in Colombia and Venezuela the dried stem bark is chewed. Variously known as *ayahuasca, caapi, yajé, pinde, natéma, oco-yajé,* and *dapa,* the brew usually includes at least one of the species of *Banisteriopsis.* Most of these species grow as giant lianas vining from the forest floor into the canopy of leaves some several hundred feet above. The panicles of pink flowers with exquisitely clawed petals are rarely seen even by those who have studied the plant and its uses.

The chemistry of *ayahuasca-caapi-yajé* etc. complex is very problematic for reason of the great number of additives. The active ingredients in the bark of *Banisteriopsis* indicated the following beta-carbolines which are effective hallucinogens: harmine, harmaline, and d-tetrahydroharmine. A notable exception is *B. rusbyana* which has in addition the potent N,N-dimethyltryptamine as well as other tryptamines, bufotenin, and a beta-carboline in its leaves. Schultes has reported that the Tukanos of the Rio Vaupés have six unidentified vines as additives. The Sinoa of Colombia add *Datura suaveolens,* another potent narcotic, to their drink. The Ingano of a neighboring area add *Alternanthera lehmannii* to their brew. The Kofán and Jívaro of Colombia and Ecuador include the hallucinogenic *Brunfelsia grandiflora. Malouetia tamaquarina* is an additive utilized by the Makuna of eastern Colombia. Schultes, who has provided us with these identifications, has stated that the Tukano of the Brazilian Rio Vaupés may possibly add a species of *Gnetum* to their drink. G. T. Prance in 1970 identified *Psychotria viridis* (Fig. 57) as an important additive containing dimethyltryptamine. The previous report of *P. psychotriafolia* was in error, but more recently *P. nitida,* which also contains DMT, has become a suspected ingredient. One of the reasons for the addition of tryptamine-containing plants as additives to the harmine and harmaline of the *Banisteriopsis* is that the latter serve as monoamine oxidase inhibitors, which enhance the action of tryptamines. This accounts for some brews being extremely powerful in their action.

The hallucinogenic effects of *ayahuasca* are probably the result of the composite activity of harmine and harmaline, which inhibit monoamine oxidase, leading to an accumulation of epinephrine and norepinephrine in the individual. Many and diverse accounts of the effects of harmine have been reported, ranging from euphoria, perception disturbance, restlessness, vivid imagery, etc. when admixtures containing tryptamines are added; as is usual in most preparations, there is a potentiating effect as a result of the monoamine oxidase inhibitors acting upon the tryptamines from *Banisteriopsis rusbyana* or *Psychotria viridis.* This more potent brew accounts for the repeated reports of soul flight, visionary experiences, supernatural contact, the appearance of transpersonal symbols and archetypes, and divinatory activities. The collective consciousness of initiates in a *Banisteriopsis* ceremony has a great deal to do with the history presented in myths, symbols, and art before the initiation; that is to say, the boy is predisposed by his elders toward an enactment of a sort of psychodrama appropriate to the occasion. This by no means negates the personal subjective elements that are beyond control. Several anthropologists working in this area have provided a succession of accounts and insights that go beyond the mere characterization of the plant and its chemistry.

In addition to the above-mentioned elements, there is one more that is worthy of greater attention than it has previously been given, namely the "sexual impressions" that the brew provides, to use the expression of Lewin. The use of the drug for aphrodisiacal effects was noted by Wiffen in 1915, Reinburg in 1921, and Dobkin de Rios in 1970 and 1972. Harmaline and harmalol have produced sexual responses in rats under laboratory conditions. Five milligrams of harmine alone produce measurable sexual activity and vaginal dilation in rats. The other two isomers contribute to the effect. The aphrodisiacal effects and the sexual responses are usually ignored or are dispatched to an obscure anthropological or medical journal where they are obliquely noted. The psychoerotic effects in the *ayahuasca* ceremonies that have traditionally involved only males and extensive flagellation are worth more careful documentation and attention. Is this in part the sort of psychodrama akin to that which Reay described in New Guinea? The only significant insights to date have come from Reichel-Dolmatoff's 1971 book, *Amazon-Cosmos: The Sexual and Religious Symbolism of the Tukano Indians.* He has systematically explored the sexual content of these visionary states.

Another unusual condition of *ayahuasca* intoxication is augmentation of vision resulting in brilliant ornamentation, unusually perceptive night vision, illusion of rapid size changes in people and objects, and a pervasive overcast of blues and violets. This depends, of course, on the composition of the brew. Excessive doses result in nightmarish visions that simulate a psychosis. Curiously, the *ayahuasquero* does not lose consciousness nor does he lose motor coordination. It has been demonstrated, to the astonishment of foreigners, that an Indian may run through a forest at night under the influence of the drug and not stumble or lose his footing. The vision is remarkably clear, perhaps augmented as *ayahuasqueros* insist, and the footing sure.

It is not only pleasurable states that may result from *ayahuasca,* but certain illnesses can be healed by those ordained to accomplish such feats. Illness has many faces and, in addition to the indisposition of the body as the result of fevers, wounds, etc., there is the condition of being bewitched or hexed by a brujo or malevolent person. In either case the *ayahuasca* healer is able to divine the illness and remove the causative agent in the mind of his patient. An elaborate documentation of this ceremony of healing as well as the use of *Banisteriopsis* in witchcraft was presented by Dobkin de Rios in 1970 after her work in a village in Iquitos, Peru.

Among the Makú in the northern Brazilian Amazon, another beverage is prepared under the name *caapi,* which may represent the *caapipinima* or painted caapi of the Rio Vaupés of Brazil. Various kinds of caapi have been reported; these may represent different species of *Tetrapteris* of the family Malpighiaceae to which *Banisteriopsis* also belongs. We know that *caapi* among the Makús is the attractive *T. methystica* (Pl. 46). This plant also is a liana whose flowers appear in brilliant yellow panicles in the canopy above the forest. Each individual flower is yellow tinged with red near the center. Bark is stripped from the plant and steeped in water until it becomes quite yellow. The infusion in cold water is drunk without adding any other plants. *Caapi* produced from this genus is very similar in content to that from *Banisteriopsis,* as attested to by Schultes, who in 1948 participated in the

ritual use of this drink among the Makú on the Rio Tikié and gave the specific name to this plant. It is believed that beta-carbolines, such as harmine and its isomers, are the active intoxicants.

Brunfelsia species have been admixtures to *caapi*, but have also been used to prepare a hallucinogenic drink apart from additives, according to reports from the French botanist Benoist. This solanaceous shrub was apparently used in the western Amazon for a considerable time, and is now used by the Kachinauas of the Brazilian Amazon to prepare a hallucinogenic philtre. *Brunfelsia tastevinii*, named after the missionary R. P. Tastevin, is utilized by these people under the name *keya-honé*. This preparation, they believe, allows them to fight all sorts of maladies. Juice expressed from the plant, when drunk, takes effect in about fifteen minutes and renders the participant speechless. According to Tastevin, "the magical properties" then become apparent and the victim of the drug sees visions of dragons, tigers, and the like, which seek to devour him. The action lasts for four or five hours depending upon the amount he has consumed. In its natural habitat the plant grows as a vine, probably due to the low light intensity of the forest floor, but when cultivated it forms a bush, seldom branching in excess of two meters. The tubular, greenish-yellow flowers terminate the branches in abbreviated pedicellate cymes.

Brunfelsia species are also known in the Colombian Putamayo as the shrub that intoxicates, and in Brazilian medicine *B. uniflora* is important in folk medicine to treat fevers, snakebite, rheumatism, etc. Work done in the Colombian Amazon by Plowman suggests that the plant used in this region is *B. grandiflora* (Pl. 47). Some of the earlier descriptions may be based upon the misidentification of this highly variable species that is widely distributed in forested regions throughout much of South America.

Earlier identifications of alkaloids under the names franciscaine, manacine, and brunfelsine seem to be insufficient characterizations, as does the coumarin, scopoletin. The action of the leaves and bark in an infusion suggests the presence of tropane-like alkaloids, but these remain to be determined.

Snuffs derived from a large number of plant species figure prominently in the ethnobotanical lore of much of South America. The practices of snuffing and the great diversity of appointments to these practices were very well documented by Wasson in 1965 in his fine monograph on this subject. Containers made of large snail shells are often used to carry snuff, and the snuffing tubes are usually made of hollow plant stems or the hollowed bones of certain birds' legs. The wide variety of forms of these tubes allows self-administration of a narcotic snuff or permits it to be blown into the nostrils of a friend (Fig. 58). These practices are rapidly disappearing through acculturation, and it is largely the astute observations of early explorers that have given us information on the practices. The precise identification of some of the botanical sources of these snuffs remained to be identified until relatively recently.

The shamanic context of use is well established and is manifest in some of the figuring on the snuffing apparatus as well as their forms. An intimate association with birds is characteristic of many snuffing practices. The snuffing tubes of tribes of the right bank of the Rio Guaporé terminate in various bird heads, and clay

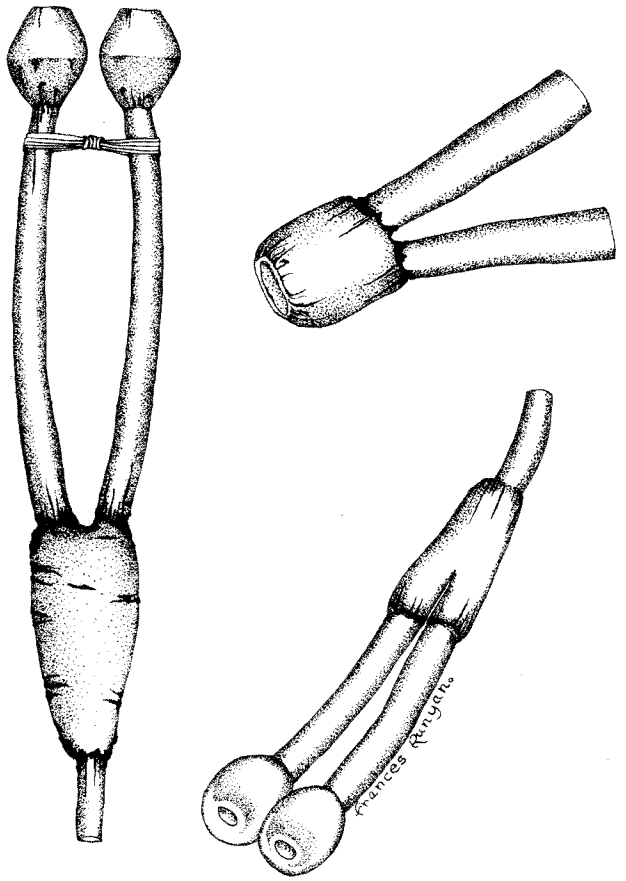


FIG. 58:
Snuffing tubes

snuffing pottery from as far north as Costa Rica reveals the form of birds that is associated with soul flight. The keen sight of the eagle makes it a sacred bird in the mythology of many of these people, and the vulture, for the presumed reason of its high flight and its ability to remain seemingly suspended in air, is also sacred. I believe that we must not neglect the role of the vulture as a scavenger in eating the dead. The role of endocannibalism among some tribes and the relationship of this practice to the birds that are represented in their myths deserve more attention. This is obliquely found in the account of Goldman, who in 1963 published a résumé of the mourning practices of the Cubeo in which the vulture is the patron of ecstatic intoxication and presides over the ceremony. It is almost a dictum that in true shamanism there is invariably the bird spirit represented, whether it be the raven of the Eskimos, the gulls of the northwest United States coast, the *mut* (vulture) of the Egyptian shaman-priest, the eagle of the American Indians, the crested harpy eagle and vulture in South America, the plover in Samoa and related cultures, etc. An

anthropologist might logically extend this to the dove as the Holy Ghost in Christian tradition. Spirit flight requires such a manifestation.

The most widespread snuffing practice involves the genus *Anadenanthera,* which was formerly included in the *Niopa* section of the genus *Piptadenia,* under which designation early studies are to be found (Fig. 59). The scholarly work of Siri von Reis Altschul published in 1972 clarified many formerly obscure aspects of the genus with respect to the correct botanical designation, patterns of distribution, cultural treatment, cross-cultural contexts, and phytochemistry. It stands as a model for the approach that is desperately needed for many other genera. This monograph, the culmination of seventeen years of investigation, does not lend itself to condensation. The snuffs known as *yopo, vilca,* and *cohoba* belong to *Anadenanthera peregrina* (varieties *peregrina* and *flacata*) and *Anadenanthera colubrina* (varieties *cebil* and *colubrina*). Von Altschul does a great service for the scientist by

FIG. 59:
Anadenanthera peregrina

distinguishing between the botanical sources for snuffs that were often confused with several other genera and species in diverse families.

Von Humboldt and Spruce both encountered and wrote of the snuff that is derived from *Anadenanthera* (thought to be a *Mimosa* or *Acacia* by some explorers). The account of von Humboldt under the notation of *niopo* was laconic, but Richard Spruce wrote a fairly lengthy and stylish account of his experiences with the seed of this legume. While he had gathered specimens of the tree in 1850, it was not until four years later, at the cataracts of the Orinoco, that he encountered a wandering group of Guahibos encamped on the savannas of the Maypures making *niopo* snuff. Spruce watched an old man roast seeds of the tree and powder them on a platter using a wooden spatula and then neatly pour the stuff into a container made from the leg bone of a jaguar. He was intrigued by the process and purchased the apparatus for the Museum at Kew Gardens. He described a Y-shaped snuffing tube and records the reaction of the Indians as being without hunger or thirst; "One feels so good," Spruce says, recording a Guahibo, "No hunger, no thirst, no tired!" It should be noted that the informant sniffed from a box of *niopo* through this tube and then chewed the bark of *Banisteriopsis*, accounting in part for the total effects. He also recorded the use of *niopo* in a clyster, which is sometimes a violent purge. After noting that the various tribes of the upper tributaries of the Orinoco all use *niopo*, he then makes a most unusual comparison between the intoxication resulting from *niopo* and that from the fly agaric, *Amanita muscaria*. The Catauixi were observed to use *niopo* before a hunt to make them more alert and clear their vision. They also administered the snuff to their dogs!

Herndon gave an account of the use of a snuff known as *paricá* among the Mundrucús of the river Tapajoz. This he derived from a French trader by the name of Maugin. The name *paricá* is here understood to be *Anadenanthera*, but the name is more often applied to resins derived from trees of the genus *Virola*. The Mundrucús powdered the seeds taken from the long pods and made them into a paste, which was dried and then pulverized once more. Their snuffing tubes were made of two heron quills (the inescapable bird imagery), which were joined side by side to make a double tube that could be inserted into the nostrils and then into a box of the narcotic snuff. Maugin stated that after a single strong inspiration (commenting on observing an Indian male), "His eyes started from his head, his mouth contracted, his limbs trembled. It was fearful to see him. He was obliged to sit down or he would have fallen. He was drunk, but only for about five minutes; he was then gayer."

Anadenanthera snuff was first reported among the Taino Indians of Hispaniola, who used it under the name *cohoba*. An authoritative identification might seem difficult when the aboriginal people of Hispaniola are all but extinct. Fortunately, Fra. Ramon Paul, a monk traveling with Columbus, had the good sense to record ethnological curiosities such as *cohoba* sniffing. Early records characterize the intoxication as stupefying in the extreme so that the participant may lose consciousness and his arms and head hang from his body. The visions are reported to include seeing the world inverted. There is little doubt that this snuff was first used by payés, or witch doctors, for ritual divination. Spruce states that he never had the good fortune to witness a genuine payé at work. His reason was that the civil

authorities persecuted these practitioners, and their offices had been taken over by the Christian padré. Since the ceremonies were not recorded in any detail in either the West Indies or the Amazon at an early date, we must take contemporaneous accounts as descriptions of practices that are probably much modified with respect to ritual.

Preparation and use of the snuff produced from *Anadenanthera* varies from area to area and between tribes. When von Humboldt was among the Maypure Indians of Orinoco in 1801 he observed the pods of the *Anadenanthera* (which he identified as *Acacia niopo*) to be broken open, moistened, and allowed to ferment. When these turned black and were soft, the seeds were removed and mixed with cassava meal and lime derived from snail shells. The cakes were dried and later provided a supply of snuff whenever it was desired. Von Humboldt felt that it was the lime from the snail rather than the *niopo* that produced the narcotic effect. He did not pursue the investigation. Not all groups add lime to their *niopo* preparations, and it is not necessary for the physiological action. The *vilca* and *huilca* in southern Peru and Bolivia, and *cébil* in northern Argentina are also derived from *Anadenanthera*, probably *A. colubrina*. Schultes reports on uses among the Inca observed in 1571, stating that the witch doctors prophesied by becoming intoxicated with *chica* (a beer) and an herb called *villca*, which they drank together.

All species and subspecies of *Anadenanthera* that have been investigated chemically contain a series of substituted beta-phenethylamines in their seeds including N,N-dimethyltryptamine and bufotenine (5-OH-DMT), which is closely related to serotonin. The activity of bufotenine is in dispute. Other tryptamines reported from this genus include: DMT, MMT, 5-MeO-DMT, and 5-MeO-MMT. The beta-carbolines are: 6-MeO-THC and 6-MeO-DMTHC. These chemical combinations are the same as those found in the related snuffs derived from *Virola* species. The snuffs have often been used under the same names, leading to a great deal of confusion in early literature.

Virola

The genus *Virola* is comprised of about fifty tree species found in the forests of Central and South America. Although in the same family as the nutmeg, their properties and uses are remote from those of *Myristica*. It was not until 1909 that the anthropologist Koch-Grünberg presented an account of the preparation and uses of a snuff, *hakudufha*, that was in use among the Yekwana Indians in the headwaters of the Orinoco River. Koch-Grünberg considered the snuff prepared from *Virola* to be a part of the ritual magic of the Yekwana. Unaware of the botanical source of the snuff, he referred to it merely as the bark of a certain tree which when pulverized and boiled to a sediment could provide a hard block of material that could be pulverized into a snuff. *Hakudufha* was blown into the air by the sorcerer and then snuffed by a reed into each nostril resulting in singing, screaming, and a convulsive movement of his body to and fro.

Not until the 1938 report of Ducke, a botanist, was it clear that in the upper Rio Negro *Virola cuspidata* and *Virola theiodora* were being used to make a snuff called

FIG. 60:
Virola calophylla

paricá. This was the same name used for snuffs prepared from *Anadenanthera*, which has led to much confusion. The greatest clarification came from Richard Schultes, who published his findings on the use of *yakee* among the Puinave and *yato* among the Kuripako in the northwest Amazon in 1954. The brown snuff of Indians in Amazonian Colombia that is used for magic, prophecy, and divination was established as *Virola calophylla*, *V. calophylloidea*, and possibly *V. elongata* (Fig. 60). Indians in this area of the Amazon strip the bark from the trees in early morning and scrape off the inner soft, red cortex that is filled with resinous exudates. These particles are kneaded in water, removed, and the water boiled to a viscous mass which is subsequently dried in the sun. The dried concretion is powdered and mixed with the ash taken from *Theobroma subincanum* to provide a snuff so potent that it has been known to cause deaths among the shamans of the region.

Among the numerous Indians inhabiting the headwaters of the Orinoco in Venezuela and the Brazilian Rio Negro, *Virola* snuffs are prevalent and are known as

epená, ebene, and *nyakwana.* These people who are grouped into the Waiká (Guaiká) use *epená* hedonistically as well as ritually. It is often used by the male Waiká over the age of thirteen even though it is possibly the strongest of the snuffs from *Virola.* Any of five species in the area might provide the necessary resins, but the species most commonly found in use is *V. theiodora.* Preparations are diverse, but the most common mode of use is to scrape the inner bark and roast the shavings over a slow fire. In this manner they may be preserved for later use. When desired, the brittle scrapings will be pounded in a mortar made from the fruit coat of the Brazil nut and to this will be added bark ash from the tree *Elizabetha princeps (amá* or *amasita)* and the powdered leaves of a pungent-smelling herb, *Justicia pectoralis* variety *stenophylla* (Fig. 61). Although little is known of the effects of the *amá,* we know that this *Justicia* has been called *bolek-hena,* or "leaves of the Angel of Death" for reason of its potency as a snuff. At least three shamans have been

FIG. 61:
Justicia pectoralis
v. *stenophylla*

reported to have died from using this snuff from the small violet-flowered acanth. While the Waiká have declared the reason for use to be to enhance the fragrance of *epená*, they are certainly aware of the added potency that has thus far been attributed to N,N-DMT.

Ceremonial *epená* is made by stripping the bark from *Virola theiodora* and placing it near a fire, which will cause the bark to exude the translucent red resins. These are gathered and reduced over heat to a crystalline mass that is ground and used most often without an admixture. The ceremonies may involve endocannibalism as a mode of communing with the departed. The syndrome of effects is an initial period of several minutes of frenzy, subsequent numbness of the limbs and loss of motor coordination combined with twitching of muscles. Nausea may develop, but when it does, the effects of the hallucinogens are already at work. Visual hallucinations are then experienced, and among the Waiká these include macroscopia, or things seen in giant forms. This is frequent among these people, and they will often give over to vocal outbursts during the period of visions. This would seem culturally conditioned, for it is inseparable from the concepts of *hikura*, the spirit who dwells in the *Virola* tree. This is a notion common also to the Bwiti of equatorial Africa, who find spirits resident in the *Alchornea floribunda* tree. Further evidence for this as a conditioned response is the evidence from the Witotos, Bora, and the Muinane tribes in Amazonian Colombia, who use the same species as an oral hallucinogen, rolling the boiled resin with the ash of *Gustavia poeppigiana*. Three to six pellets the size of coffee beans induce a hallucinatory experience of several hours in which "little people" are seen and clarification of problems comes. The contrasting visions, one small, the other large, must be explained on the basis of either cultural conditioning or the effects due to the admixtures. *Virola* research in the future will probably be directed toward investigating the practices among certain Venezuelan Indians, in which *Virola sebifera* is reportedly smoked in ritual dances and for curing fevers. The greatest body of data to date derives from the extensive research of Richard Schultes throughout much of the Amazon in his seventeen years of study there. It was this scientist who also pointed out the practice among the Makú of Amazonian Colombia of drinking the unprepared resins of *Virola elongata*.

Seitz in 1965 reported in an appendix to Wassén's monograph of that year on his work among the Waica (Waiká) and came to the conclusion that there was no system in the snuffing ceremony and that he did not find these people to be witch doctors or medicine men. This observation, based upon two visits to the Amazon, in no way invalidates the more extensive and intensive research of Schultes, who has given us a comprehensive survey based on extended periods of living with these people.

The four tryptamines and two beta-carbolines present in *Anadenanthera* are all to be found in the various species of *Virola* distributed among the bark, roots, leaves, flowers, and shoots. The greatest concentration of DMT is consistently in the leaves of the species and ranges between ninety-three and ninety-six per cent. It is postulated that the tryptamines are the active psychotomimetic while the beta-carbolines serve as monoamine oxidase inhibitors. It is interesting to note that

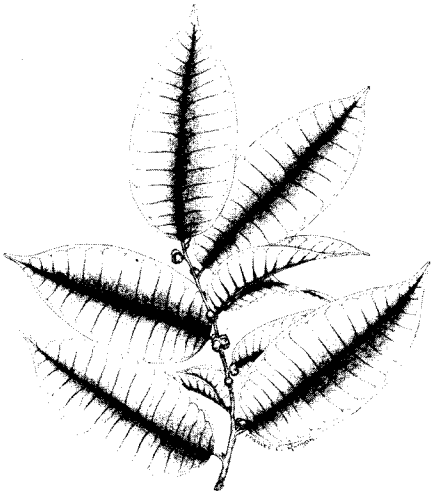


FIG. 62: *Olmedioperebea sclerophylla*

FIG. 63: *Mimosa hostilis*

DMT is not active when taken orally. This accounts for the popularity of snuffing, a practice whose origins are not only obscure, but baffling.

Several snuffs used in South America remain obscure with respect to botanical origins, preparation, and use. One that is known to have been used in the central part of the Brazilian Amazon, especially along the upper Xingú, is *Maquira sclerophylla (Olmedioperebea sclerophylla)* (Fig. 62). This giant tree belongs to the fig family and produces fruits that have presumably been made into a snuff in times past in the Pariana region, where it is known as *rapé dos indios*, a Portugese term that means Indian snuff. Schultes believes that the use of this snuff has died out, but that formerly it was employed in rituals and dances. An analysis of these fruits has yielded no information with respect to a narcotic property, and there is no information as to how the fruit might be prepared as a snuff.

Mimosa hostilis is a legume that is closely related to *Acacia* (Fig. 63). This thorny shrub is important to the jurema cult, which consisted of numerous tribes that have now been acculturated for the most part and no longer participate in the miraculous drink from this plant, which is called *ajuca* or *vinho de jurema*. In the states of Pernambuco and Paraíba, it was used by the Karirí, Tusha, Fulnio and Pankarurú. Other tribes using it were the Acroa, Guegue, Atanayé and Pimenteria. There is no doubt that it was of widespread importance in eastern Brazil, but as with other hallucinogens, its use seems to have all but disappeared and, were it not for reports from 1788 and 1843, we would know nothing of the plant or its use. The 1946 reports of Lowie indicate that this drink was prepared from the roots of the shrub and given to priests and warriors. In the ceremony involving kneeling and a reverently bowed head, the priest administered a cup of the root decoction to the

young warrior while old women sang songs of the jurema ritual. After receiving the draught from the old shaman-priest who carried a feathered rattle, the youths would see a magical land filled with birds and flowers and the crashing rocks that destroy the souls of the dead: the realm where the exquisite Thunderbird propels lightning from the crest of his head and runs about producing thunder. *Jurema branca* may refer to the preparation from either *Mimosa hostilis* or *M. verrucosa.* In the utilization of the latter species the bark is stripped from the shrub known as *caatinga.* Nigerine, formerly believed to be the active ingredient of the jurema, has now been identified as N,N-dimethyltryptamine.

ANDEAN HIGHLANDS AND ADJACENT AREAS

Most important among the hallucinogenic plants of the Andean highlands is the genus *Datura* represented here by its most unusual members. All belong to the subgenus *Brugmansia* and are arborescent, bearing trumpets of white or sanguine flowers hanging in abundance among the branches. Only *D. suaveolens* grows in the warmer lowlands; the rest *(D. aurea, D. candida, D. dolichocarpa, D. vulcanicola,* and *D. sanguinea)* are indigenous to the cooler highlands. The *Daturas* of the Andes differ from their relatives in North America and Central America in both morphology and the usual modes of use. Most often, the seed is powdered or ground into a meal and put into beverages of various sorts. The result is a narcosis so violent that the participant often has to be physically restrained to protect himself from others. Eventually he will be overtaken by an extended sleep with waking fits of hallucinations and colorful visions that are understood to be communication with the spirit world and souls of the departed. The intent is to become prophetic through divination. These visions are induced by the tropane alkaloids, hyoscyamine, nor-hyoscyamine, and scopolamine. Each species varies with respect to the concentrations of these alkaloids, but they are all in abundance in most parts of the plants. Tree *Daturas* are imperfectly known to botanists because of the large number of cultigens and hybrids as well as those plants that have been deliberately changed through viral infections. The Kamsá and Ingano tribes in the southern Colombian highlands have created monstrous varieties through the perpetuation of viral infection. They have long believed that these plants are superior to any others, and the practice is copied in the Ecuadorian highlands. It would seem that most of the tree *Daturas* and their varieties, to include these bizarre atrophied forms, are the result of man's historical cultivation and selection.

It was an ancient practice among the Chibcha of Colombia to administer *Datura aurea* (possibly *D. candida, D. suaveolens,* or *D. sanguinea* as well) in a corn beer (*chicha*) to the wives and slaves of a departed husband or master, and in the state of stupor that followed, they were buried alive with the deceased (Fig. 64). Sogamoza, north of what is now Bogotá, contained the Temple of the Sun, and it was

FIG. 64: *Datura suaveolens*

here that the beverage *tonga* was made to be used in ceremonial ritual. It was prepared from *D. sanguinea* and was far more potent than that prepared from the other tree *Daturas*. It is this same plant that is known as *huacacachu* or grave plant in Peru, where it is believed that the narcosis from *D. sanguinea* will reveal, in a trance state, the site of ancient graves that contain treasures.

Among Ecuadorian Jibaro, children who misbehave are given *Datura* seed preparations so that their ancestors might visit them and admonish them. An earlier practice, now extinct, was for a nursing mother to smear her paps with crushed *Datura* to cause an unwanted child to die. This practice suggests the old English use of wormwood to wean a child away from his mother or nurse.

At one time a male who was coming of age in the western Amazon was obliged to take a draught of *maikoa*, or *Datura* infusion, from each male elder in his tribe. Obviously a boy could not take any considerable amount of the brew orally, so after a time the elders inserted a hollow bone or horn into the rectum of the lad and with a pouch of *maikoa* attached, they were able to administer anal doses until a deep comatose state set in. The purpose of this ritual enema was the same as that among North American Indians. The child was to forget the things that pertained to his youth and be advised in this trance by his ancestors of things that related to the proper life-style for a man.

Much lore concerning the tree *Daturas* has been uncovered, but there is a great deal yet to be learned about contemporaneous practices and those practices that have been lost but yet remembered. If we accept this as the center of origin for this section of the genus, then its widespread contemporary distribution that parallels the habitations of man in much of South America is to be explained on the basis of selection, cultivation, and even hybridization by man to produce desirable strains.

In 1955 Richard Evans Schultes described a large tree that had the characteristics of some of the *Daturas*, but was quite extraordinary and different in many of its features. Only in the Valley of Sibundoy in the southern range of the Andes of Colombia is this bizarre production to be found. In the Kamsá language of the region it is called *mitskway borrachera;* another name for it is *culebra borrachera* (literally drunken snake, possibly a reference to the effects as well as to the twisted elongate leaves). *Methysticodendron amesianum* is thought by some to be a cultivar or aberrant form of *D. candida*, but the collective features, including the leaves, the white flower that is up to a foot-and-a-half in length, and the gigas form argue against this (Pl. 48). The characterization by Schultes in 1955 still seems to be more taxonomically acceptable than other theses that suggest viral infections of a *Datura*, the pleiotropic effect of a single gene, or the cultivar hypothesis. The tree is clearly a departure from the genus *Datura* deserving of the generic disposition given by Schultes. The natives who propagate the plant asexually (the most common mode of propagation with most tree *Daturas*) regard it as more potent than *Datura* and use it in instances where extraordinarily difficult divination must be accomplished. The chemical analysis showing the leaves and stems to contain eighty per cent scopolamine in the total assay of alkaloids indicates its potency, which is manifest in excitement, delirium, hallucinations, and coma.

Throughout the central Andes one frequently finds the cactus *Trichocereus*

FIG. 65:
Trichocereus pachanoi

pachanoi in cultivation under the name "San Pedro" (Fig. 65). The form of this plant is much like that of *Cereus,* growing to twenty feet in height and comprised of fleshy six- to eight-ribbed branches with few spines. When the latter are present, they are in groups of three to seven. At night the enormous flowers appear at the tip of the branches exuding fragrance from the pale buff outer petals and the reddish inner ones. Although the plant is not closely related to *Lophophora* (peyote), it contains mescaline in the flesh. Throughout eastern Ecuador and Peru the plant is widely cultivated and used to make a hallucinogenic brew called *cimora.* The cactus is stripped of any spines and cut into pieces that are placed into a cauldron with *Neoraimondia macrostibas, Iresine, Isotoma longiflora, Pedilanthus tithymaloides,* and one of the *Daturas.* Water is added to the mixture, and it is allowed to cook for several hours until it has the consistency of pea soup. The brujo or curandero who administers a cup of the brew to his client expects vomiting to follow, and then a period of revelation in which questions may be asked of the intoxicated person or he may be asked to choose among a series of objects, each of which has an individual and collective meaning to the brujo. It may be used in order to take possession of the soul of another. In some instances, it is the brujo or bruja

FIG. 66:
Lobelia tupa

who ingests the liquid in order to divine or become prophetic. The antiquity of this ritual use was indicated by Douglas Sharon, who in 1972 wrote of the use of this plant (San Pedro) among folk healers in coastal Peru. Douglas Sharon found images on funeral pottery and painted textiles of Chávin, an Andean civilization dating to 1000 B.C. It reappears later in the ritual art of the Moche and Nazca cultures.

Since mescaline is two per cent of the composition of San Pedro as measured by dry weight, we may expect the effects to be similar to those of peyote unless the admixtures are present that may alter the visions. Dobkin de Rios in 1972 documented a healing ceremony in Peru in which both the folk healer and patient drink a San Pedro brew in order to divine an unknown illness. It would seem that the plant has not been used as a personal inducement to religious contemplation, nor is there evidence for a hedonistic use in Peru or Ecuador. Since the fast-growing cactus has a hardy root system, it is often used throughout the southwestern United States for grafting purposes, in which instances more tender cacti are grown on this

plant. A widespread knowledge of the properties of the plant and its current legal status have made it a plant of considerable importance in the United States drug subculture. It is widely available in most cactus nurseries, where it is often sold as an ornamental.

Another plant in wide employ among the Kamsás and Inganos of the Sibundoy, a valley existing at an elevation of 6,700 feet, is *Iochroma fuchsioides (I. umbrosa)* (Pl. 49). Schultes, who has studied this plant in some detail in its habitat, refers to it as a magico-religious narcotic. Formerly the status of use among the people of southern Colombia with respect to this plant was in question. The early studies of Schultes in 1946 had implicated the plant, and later it seemed not to be verified by subsequent investigators. Returning in 1974 Schultes in extensive discourse with a leading Kamsá medicine man found that *Iochroma fuchsioides* leaves were used for difficult diagnoses, divination, and prophecy. The medicine man employing the leaves is often ill for a day or more following his use of the material. Fresh bark and leaves are boiled together and cooled. One to three cupfuls taken over a three-hour period induce hallucinations. It was reported that the plant used to be employed more frequently in earlier days. Known by a variety of popular names such as *borrachera* (intoxicant), the plant is grown by Kamsá medicine men along with *Datura candida* and *Methysticodendron,* indicating something of its status. In chemical analyses thus far, it has not been possible to isolate a known hallucinogen from this red flowered shrub, but it seems that tropane-like alkaloids might be present due to its botanical affinities.

The family Campanulaceae is so large that it has been divided into three subfamilies of which Lobelioideae is one. The distinctions found within this taxon have brought some taxonomists to the view that it should be treated as the family Lobeliaceae. *Tupa* or *tobaco del diablo* is derived from *Lobelia tupa* of the Chilean highlands (Fig. 66). The plant is in no way related to the tobacco of commerce. The tall and highly variable herb has found a place in folk medicine, as the leaves may be pressed to exude a juice reported to be useful in curing toothache. More interesting is the practice among the Mapuche Indians of smoking the leaves for their intoxicating effects that may extend into the realm of hallucinations. We must recall the use of *Lobelia inflata* in North America among the Penobscot Indians of the eastern states. When in 1785 Cutler published his account of this herb and its uses, he noted that the leaves when chewed "produce giddiness and pain of the head, with a trembling agitation." This was the plant that he called "Indian tobacco." While these properties were later ascribed to lobeline, which is also found in *Lobelia tupa,* there may be other yet undiscovered chemicals contributing to the syndrome. In *L. tupa* lobeline, lobelamidine and norlobelamidine have all been reported to be present. Although no one of these may be considered as a hallucinogen, the effect on the Mapuches is much like that reported for the Penobscots. This same family provides *Isotoma longiflora,* an ingredient in *cimora* of the Peruvian Andes and a plant for which we have no satisfactory assay.

In the southern parts of Chile the hillsides support a shrub growing to about three feet in height and known to the natives as *taique* or *chapico.* The botanist recognizes this plant as *Desfontainea spinosa,* based upon its tubular flowers that

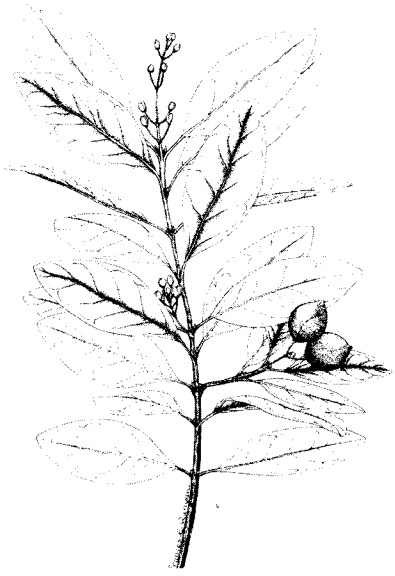


FIG. 67: *Gomortega keule*

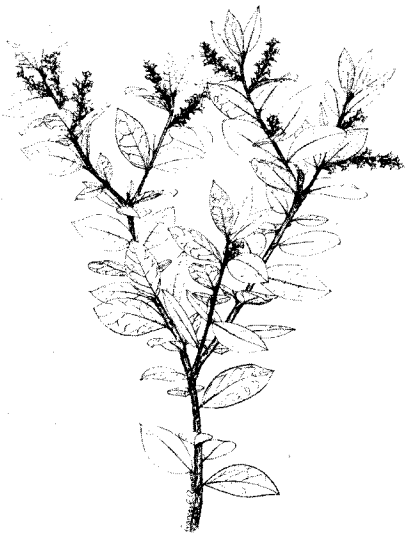


FIG. 68: *Pernettya furens*

are bright red tipped with yellow and its holly-like leaves (Pl. 50). *Desfontainea* is the only genus in that family, Desfontainiaceae (formerly included in the Loganiaceae or Potaliaceae), and the variety known as *Hookeri* is that employed as a narcotic. Although it has been known for some time that the leaves of this plant have been used as both a medicant and a narcotic, chemical analyses remain to be carried out.

The Chilean Mapuche Indians also utilize the fresh fruit of the tropical endemic tree *Gomortega keule* of the family Gomortegaceae (Fig. 67). This primitive tree is related to the families Atherospermataceae and Lauraceae and is considered to be primitive among flowering plants. The entire distribution pattern for the tree is within the area of only one hundred square miles. Known as *keule* and *hualhual*, the tree may be found on forested slopes and is easily identified by the shiny evergreen leaves and the small fleshy plum-like fruits that are fragrant and rich in essential oils. It is the fruit oils that are intoxicating, and fresh fruit seems to be more potent than dried. It has been suggested that physiological ammoniation of these oils in the human body may produce an amphetamine-like hallucination, but concrete evidence for this is lacking.

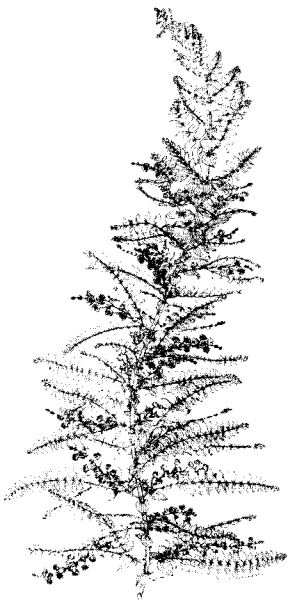
Pernettya furens belongs to the heath family and is common to Chile and surrounding areas (Fig. 68). The fruits are called *huedhued* or *hierba loca*, since eating them causes mental confusion, delirium, and in excess is said to provoke a permanent mental condition that mimics insanity. Some have compared the intoxication to that produced by *Datura*. A related species in Ecuador, *P. parvifolia*, known as *taglli*, is known to cause hallucinations and lack of motor coordination.

There is some debate over whether this intoxication is deliberate or accidental, but recently Naranjo has argued for purposeful intoxication. *Pernettya parvifolia* contains andromedotoxin and arbutin, a resin and glucoside respectively. Neither of these may be considered hallucinogenic, but the behavior of the individual who has consumed fruits of these species exhibits every characteristic of one who has experienced a powerful hallucinogen.

In the montane areas of central Chile one infrequently encounters the shrub or small tree *Latua pubiflora*, which was first described in 1888 and also known under the name *L. venemosa* for reason of the venomous nature of the leaves, which contain hyoscyamine and scopolamine (Fig. 69). It is interesting that the natives insist that the fruits also intoxicate, for an analysis of some of the dried fruits revealed no hallucinogens or related compounds. Perhaps fresh fruit might provide different information. In the province of Valdivia, the plant has been known as *latué* and *arbol de los brujos* (tree of the warlocks or sorcerers), for like *Pernettya* it may induce a permanent madness. Those who inhabit this area believe that an accomplished sorcerer can provide a madness of predictable duration according to dosage. Both the preparation and dosages remain carefully guarded secrets in the hands of these malefactors. No cult use apart from the activities of brujos surrounds the plant, and it is generally regarded with fear and suspicion. Given the chemical composition, the hallucination should be much like that from *Datura* or *Hyoscyamus*. It is found only in moist shaded areas, sometimes advancing into meadows at altitudes of about 1,500 feet.

FIG. 69: *Latua pubiflora*

FIG. 70: *Coriaria thymifolia*



Coriaria thymifolia is found throughout the Ecuadorian Andes as a shrub that is toxic to browsing animals (Fig. 70). It is the only genus in the family Coriariaceae, which is related to the family Sapindaceae. Frond-like leaves of a pinnatifid nature grace the branches, and lateral spikes of tiny flowers are displaced by clusters of small purplish fruits. These fruits when ingested provide sensations of flying. This is thought to be due to catecholic derivatives or an unidentified glucoside. The plant is called *shanshi,* and its use is restricted to sorcerers who indulge in magical flight.

EUROPE AND THE MIDDLE EAST

For all of the herb lore of Europe a few centuries ago, little survives today, and an enumeration of hallucinogenic plants in this area seems comparatively depauperate. I believe that the best explanation for this comes from the famous anthropologist Weston LaBarre of Duke University, who pointed out that the Eurasiatic shamanistic tradition persisted in Western culture in the shamanistic metamorphoses of Zeus, the weather-shaman Hera, the shamanistic trident shared by the brothers Zeus and Poseidon, the animal alter egos of the gods (Apollo—wolf; Zeus—serpent, thunderbird; Artemis—stag; Athena—owl, snake; Dionysus—bull; etc.). Even the gods had their oracles: Zeus at Olympus and Apollo at Delphi. Did the Delphic Oracle have hallucinogens in the censer while she reposed on her three-legged stool? By what magic did Circe change men into swine? What was the odorous ambrosia of the gods? How does one explain the potency of the seed cake of Ceres? In one brilliantly laconic statement, LaBarre answers many of these questions: "And when the anthropomorphic God dies, we have left the impersonal forces of science." As Harner pointed out in 1973, the additional factor of the Church considering shamanic practices and the utilization of hallucinogens to be heretic led to the abolition of such practices, obscuring much of the Western tradition. Thus the traditions of shamanic witchcraft are regarded by some scholars as a fiction created by the Church, especially during the Inquisition. We must remember that early Western civilization had its roots in a strong Eurasian shamanistic background, and this remains reflected in our mythology. Displacement of these traditions has left only hints of ritualistic practices, which were doubtless as varied and bizarre as those found among aboriginal peoples of today. By culling mythology, witchcraft, and folk medicine traditions from European lore, we may find an even greater number of psychoactive plants that have been employed in the Old World as compared to the New World traditions.

Instead of centering our attention solely on aboriginal cultures and the remnants of defunct New World cultures, perhaps we need to relearn the roots of our own shamanistic traditions and find the specific plants that were associated with that which is now taken to be myth and legend. A reinvestigation of the mystical Old World and its supernatural traditions is sorely needed.

Syrian rue is a name used to describe a woody perennial shrub found growing in dry areas of the Mediterranean, in northern India, Mongolia, and Manchuria. Known to botanists as *Peganum harmala* of the family Zygophyllaceae, it is famous for its use in producing the dye called "Turkish red," which is obtained from the abundant

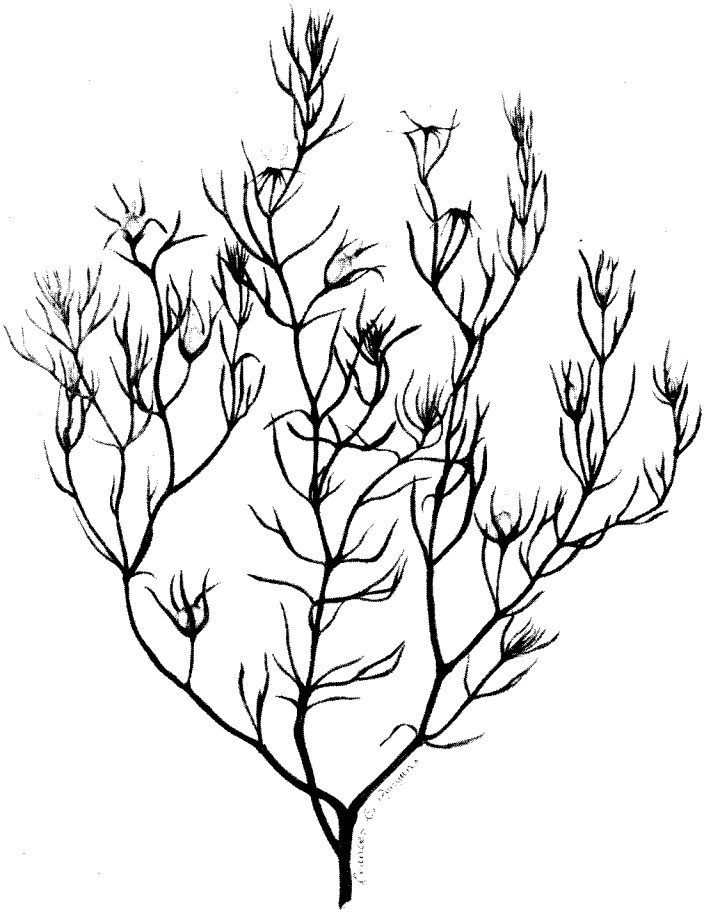


FIG. 71:
Peganum harmala

seed (Fig. 71). It is used to produce color characteristic of all of the Iranian and Turkish carpets. Dioscorides spoke of this plant in his famous codex *(Codex Vindobonensis)* of the first century. The written history of this plant extends over a thousand years. In Egypt the oil from this seed is sold as *zit-el-harmel* and has the reputation of being an aphrodisiac. Medicinal uses extend to its use in treating diseases of the eyes, as a vermifuge, soporific, lactogogue, etc. The seed is widely known as a narcotic, and analyses reveal harmaline, harmalol, and harmine. Harmine is now in use in research on mental disease, encephalitis, and inflammation of the brain. Small doses are stimulating to the brain and reportedly are therapeutic, but in excess harmine depresses the central nervous system. During the Second World War, Nazi "scientists" used harmine to advantage as a truth serum. In reality there is no truth serum, but an alteration in thresholds of consciousness may make a person loquacious. A crude preparation of the seed is more effective than any extract because of the presence of related indoles. The Douvans of Bokhara used to inhale the smoke of burning *Peganum harmala* seed and became quite exuberant,

FIG. 72:
Atropa belladonna

much in the manner of the people of South America using *caapi*, which has the same class of chemicals. This is one of the few clues as to possible historical uses in a shamanic context, and at this time no one has done any thorough research on it.

Notable among the European herbs used to induce hallucinations is the enchanter's nightshade or *Atropa belladonna* (Fig. 72). Known as devil's herb, apples of Sodom, and deadly nightshade, this solanaceous plant is said to be tended by the devil himself, who nightly looks after this plant except on Walpurgis night, when he retires to the mountains to prepare for the witches' sabbath. At such a time the herb may metamorphose into an enchantress lovely to behold, but deadly in the viewing. Another tradition relates that Roman priests would drink an infusion of belladonna before appealing to Bellona, goddess of war. *Atropa* is derived from the name of one of the Greek Parcae, *Atropos*, who was believed to be responsible for measuring out

the thread of a man's life at the time he was born. The ancient Norse knew the plant as *dwale*, meaning trance, stupor, or sleep.

In the Bacchanalian orgies a spiked wine was drunk, which purportedly contained belladonna, mandrake root, and other narcotic adulterants; such additives would explain the frenzy and hysteria that are not characteristic of wine intoxication, and yet figure prominently into the *sparagmos* of the maenads or bacchantes who tore apart living animals and children. *Atropa* also figures into medieval witches' brews and flying ointments along with henbane, mandrake, and the fat of a stillborn child. The mixture was used as an ointment rubbed onto the body or introduced via the mucous membranes of the vaginal labia. This practice is associated with the witch on her "anointed" broomstick.

Bergamo, who wrote about 1470–71, left an unpublished manuscript, now in the Bibliothèque National, Paris, which was translated by Hansen in 1901. In this we find an account of witches who "anoint a staff and ride on it to the appointed place or anoint themselves under the arms and in other hairy places. . . ." Many women were accused of participating in witchcraft in such a manner. Spina in 1523 told of the Inquisition in the diocese of Como, which was carried out in the walled city of Lugano. A wife of a notary of the Inquisition was accused of being a witch and a sorceress. Her husband sought after her when she was absent on Good Friday. He finally encountered her in the pigsty. "There he found her naked in some corner, displaying her genitals, completely unconscious and smeared with the excrement of pigs." She confessed to having made the witch's journey and drowned herself before she could be burned.

Andrés Laguna, physician to Pope Julius III, in 1545 gave an account of seizing from a married couple accused of being a witch and a warlock, a jar half-filled with an unguent he determined to be nightshade, hemlock, henbane (*Hyoscyamus niger*, Fig. 73), and mandrake. Being a physician, he tested his find on the wife of a hangman in the city of Metz. Since the woman suffered from insomnia, Laguna decided to test the baneful unguent, anointing the woman "from head to toe." She fell into a deep sleep for thirty-six hours. Since she had had lascivious and unfaithful imaginations during this period, Laguna concluded that such potions corrupt the memory, leading to the firm belief by the anointed ones that they have done all that they dreamt in a waking state.

Giovanni Battista Porta in 1562 wrote a book on *Natural Magic* in which he elucidated the contents of witch's salve, which he reports he gleaned from speaking with and observing witches. The revelation was as follows (botanical identifications in parentheses are my own): "they mix eleoselinum, aconite (*Aconitum napellus* root), poplar branches (*Poplus* tree buds provide a lipid balm as a matrix in which to retain the active principals), and soot. Or sometimes sium (*Helosciadium nodiflorum*, an umbel known as sion and marshwort), common acorum (*Acorus calamus* whose rhizome oils are known to be narcotic), the blood of a bat, sleep-inducing nightshade (*Atropa belladonna*), and oil." All of this was mixed with boy's fat that had been boiled in a copper kettle and strained. After describing the effects on a self-professed witch who stripped before him and anointed herself thoroughly with the mixture, he cautions melancholics who experiment with the

salve, "since their nature is chill and cold nothing very much happens to them from the warming-up methods of witches." Several twentieth-century experimenters have followed the receipt of Porta and experienced the strange visions. Obviously the boy's fat, soot, and bat blood are unnecessary. It should be mentioned that *Aconitum napellus* is a deadly root, and the popular name wolfbane derives from its use in poisoning wolves.

The visions of flying and the common belief of being transformed into one or more of several animals may well explain, in part, the animal alter ego of the shaman. It also sheds light on the vampire (witches were invariably accused of sucking blood), and even the werewolf syndrome. In a book by Porta in 1589 he gives a specific formula for making a man believe that he is transformed into a bird or a beast: henbane, mandrake, stramonium, or *Solanum manicum*, and belladonna. Such a combination would do much to explain lycanthropy. Paulus Aegineta, a

FIG. 73:
Hyoscyamus niger

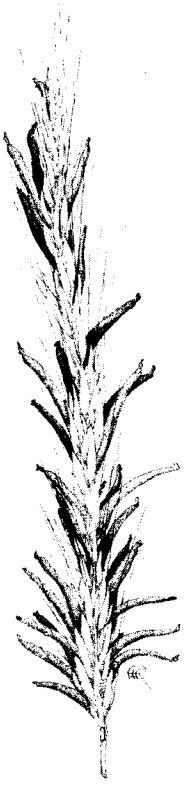


FIG. 74:
Claviceps purpurea

Greek writing of lycanthropy in the fourth to seventh centuries, states that in addition to imitating wolves and lingering about sepulchres, they are recognized by their pale flesh, feeble vision, parched mouth, and ulcerations of the legs from falling a great deal. The formula presented by Porta would produce just such effects due to the abundance of hyoscyamine, scopolamine, and atropine. Thus, there is a botanical, historical, chemical, physiological, and psychological basis for belief in witches, warlocks, sorcerers, vampires, werewolves, and just about every other implausible figure in history. A fine exposition of the role of hallucinogens in European witchcraft was presented by Michael Harner in 1973.

An overview of hallucinogens in Europe would not be complete without an account of "Saint Anthony's Fire," a disease that led its victims on a flight to Egypt to seek help at the shrine of St. Anthony, who had founded an order to care for those afflicted by "Holy Fire." Since the Middle Ages, famine has usually resulted from failure of the staple grain crops upon which most civilizations depend. In times of severe shortage, every ounce of grain becomes a precious commodity, and diseased crops that are usually rejected are ravenously consumed. A peculiar dark grain which the French dubbed *argot*, referring to a spur, became transliterated to ergot.

This is the result of individual grains becoming parasitized during their development by the fungus *Claviceps purpurea* (Fig. 74). Once the grain contacts the spore, it is soon replaced by the fungal body that develops on it producing a dark purple-brown grain-like structure that is about a centimeter in length and furrowed, resembling the normal grain. It has been estimated that a crop infected with less than one per cent of ergot is sufficient to cause an outbreak of the plague known as *ergotisme* or ergotism. Desperate harvesting in famine years resulted in the contamination of bread so that entire villages would fall prey to the disease, which led to the speculation that such villages were possessed of the Devil and suffering in his eternal fires. Pregnant women would spontaneously abort, others would suffer strange delusions and feel their bodies being consumed by flames. After a time, the afflicted would exhibit gangrenous limbs and a number would die. The Order of Saint Anthony, who is easily recognized by his companion the pig, would care for these victims. Until the seventeenth century, a number of these orders exhibited the fallen limbs of their patients as a testimonial to the numbers of afflicted who had been treated.

Midwives soon learned the source of this evil and employed grains of ergot in their practices. They found that five to nine of the ergot grains could be administered to hasten difficult births without any post-parturition hemorrhage. Later ergot was to find its way into diverse medical practices. One of the most popular contemporary uses is to combine the ergot with caffeine to constrict dialated capillaries in instances of migraine headaches. Unfortunately, not all migraines are caused by vasodilation and in some instances the medicine is of no avail.

In 1906 ergotoxine was isolated as the first alkaloid to be derived from this peculiar ascomycete. Later, in 1920, ergotamine and ergotaminine were identified, and subsequently close to a dozen other alkaloids have been extracted and identified. Ergometrine (ergonovine) is the component responsible for hemostatic action in the uterus. Isoergine (isolysergic acid) seems to induce apathy and mental depression. Both elymoclavine and lysergol are central nervous system stimulants. The action of d-lysergic acid is that of somnolence and a clouding of consciousness. In 1938 Albert Hofmann of the Sandoz Laboratories synthesized d-lysergic acid diethylamide, which is better known under the initials LSD. The hallucinogenic activity was demonstrated in 1943, for this the most powerful of hallucinogens. In man the effective oral dose of LSD is 0.05 mg. It seems unfortunate that much of the research conducted to determine the possible injurious effects of this hallucinogen has involved massive doses injected in the peritoneal cavity of rodents.

The accounts recorded by Hofmann in April of 1943 are as revealing as any with respect to the action on the human body. After an initial ingestion of what he suspected to be LSD-25, for reason of its being the twenty-fifth isolate in the lysergic acid series, he put the material aside for a week. Then, under controlled conditions he took an oral dose of one-quarter of a milligram of LSD, a large dose for a human, and experienced six hours of spectacular and dramatic visionary experiences involving new and unexperienced levels of consciousness. Since this time, the drug LSD has provoked more controversy than any other. Those who argue that the drug

may precipitate a psychosis are confronted with the dilemma of not being able to ascertain how many of these individuals would have become psychotic in the absence of LSD. Those who argue for its safety must take into account the unpredictable behavior of the participant. The belief that one has the ability to soar may be tested. Flying and levitation are not uncommon to this experience.

While a number of psychiatrists have conducted LSD therapy with some interesting results, there are behavioral patterns that even these neo-shamans cannot predict. In one individual the same dosage has different effects at different times. The widest testing programs were carried out as covert activities of the CIA and the Pentagon in cooperation with the U.S. Army. Over a twelve-year period individuals were being subjected to LSD experimentation, without the drug being identified to the individuals in many instances. This was during a period when civilian medical research was being restricted and curtailed. The Army sought Hofmann for a process whereby they might produce many kilograms of the material. During this period the drug remained illegal, and the penalties for conviction were harsh. A New York *Times* exposé of August 1, 1975, uncovered the aforementioned, making it obvious that the military sought the material as an element in chemical warfare, for the amounts sought would have easily "turned on" a city the size of greater Los Angeles! All of this was carried out while information suggesting chromosomal damage, spontaneous abortion, permanent psychoses, and other disasters resulting from the drug was being systematically fed to the public.

The appearance of a new hallucinogen regularly arouses a kind of moral indignation among the public. New pleasures are always the stimulus for the alteration of existing moral values, so that judgements are rarely rational and have a tendency to reflect fear, confusion, and uninformed moral pronouncements. It is only after some experimentation that drug abuse may be properly defined, unless it is accepted that all drug use constitutes abuse. Laws surrounding LSD use have been based more on panic and power than on research data. None of this suggests that LSD is safe or is not; it does serve to point up the dilemma of the Western world that has lost its shamanism and has not successfully supplanted it with religion. There is every reason to believe that man still requires some respite from his physical and psychological woes and the freedom to step beyond himself. Control by legislation has not historically been of any success.

Lewis Lewin said "man has a passionate desire to flee from the monotony of everyday life." I think that we might append to this the *fear* of everyday life as well. In an age of great uncertainty and great despair, it is understandable that man will attempt to seek other realms, to reach out beyond the impersonal forces of both science and technology to experience a world created both from without and from within. *Induced* personal mysticism is not new to the world, and it is not likely to disappear. Since man first strayed from the non-nutritive aspects of the plant world and explored the realms of consciousness within himself, he has never departed from these forays. Withholding judgment, it is safe to say that man has, and always will attempt to explore his diverse states of consciousness. This renewed broad interest in experimenting with the selves within may best characterize the past several decades of this century as reviewed by some future historian.

APPENDIX II

A Summation of the Botany Geography, Psychopharmacology and Chemistry of Narcotic Plants

This appendix is an abbreviated synopsis of those plants figured in the text. Where several different species of a genus are mentioned, a characteristic species has been chosen to represent the narcotic members of that genus. Common names have been chosen either because they are commonly used in the area to which the plant is indigenous or are widely used. Species names, as well as generic names, correspond to those in current use. Where a name is abundant in the literature, although a synonym, it is presented as well in parentheses following the most frequently used citation. Authors of the species appear in this appendix but not in the text. These will be found immediately following the specific epithet. The narcosis corresponds to the traditional categories represented in the text rather than the categories that have been proposed in Appendix I. The author is aware that such simplification of a behavioral syndrome is imperfect, and the reader is referred to the text and Appendix I for a more complete characterization of the narcosis.

Entries are alphabetized according to genus and species. Question marks have been introduced where the narcosis is based upon inconclusive reports or where the nature of the active principle is in doubt or has not been established with certainty.

The following arrangement is used throughout this appendix:

Genus species (both in italics) Author (s) Local or common name
Family
Habitat
Botanical description
Primary narcotic effect
Active principle(s)

Acorus calamuus L. "Sweet Flag," "Sweet Calomel"
Araceae
Northern United States and Canada
In bogs or marshy areas
Terrestrial herb from creeping rootstock; leaves sword-shaped, to 25 cm or more; the lateral greenish spadix, 5–16 cm long, spathe narrow and not prominent.
Mild hallucinogen
Beta-asarone

Actaea alba (L.) (Mill. *A. pachypoda* Ell.) "White Baneberry"
Ranunculaceae
Eastern Canada south to Georgia, Louisiana, and Oklahoma
Rich wooded areas
Perennial herb, to 1 m tall; leaves large, 2–3 ternately compound; leaflets sharply toothed; flowers small, white in a dense long-peduncled terminal raceme; berries white, with a persistent stigma.
Hypnotic
Unidentified

Actinidia polygama (Sieb. & Zucc.) Maxim. "Chinese Cat Powder"
Actinidiaceae
Japan
Thickets and woods in mountains
A deciduous, scandent shrub; leaves ovate to elliptic 6–15 cm long; often leaves near the inflorescence white on upper half of upper side; flowers axillary, white, pendulous with many stamens; fruit a berry.
Tranquilizer with mild hallucinogenic effects
Metatabilacetone and actinidine

Aesculus glabra Willd. "Ohio Buckeye"
Hippocastanaceae
Central and Eastern United States but not along the southeast coast
Woods, thickets, base of bluffs
Tree to 17 m tall; leaves palmately compound with 5–7 leaflets; flowers greenish-yellow in many flowered, large panicles; fruit prickly with shiny, large, dark-brown seeds.
Hypnotic
Aesculin (esculin)

Aesculus pavia L. "Red Buckeye"
Hippocastanaceae
Most of the Eastern United States
Moist deciduous forests, low woodlands and swamp margins
Shrub or small tree to 4 m tall; leaves palmately compound with leaflets up to 8 cm long; flowers scarlet in a terminal panicle; capsule to 7 cm in diameter with light-brown seeds.
Hypnotic
Aesculin (esculin)

Alchornea floribunda Müll. Arg. "Niando"
Euphorbiaceae
West Tropical Africa, Congo, Uganda
Forests
A leaning, semi-climbing shrub or small tree to 10 m; leaves obovate-oblanceolate, 20–35 cm long; flowers dioecious, in branched inflorescences, green; fruits capsular.
Hallucinogen
Yohimbine (questionable)

Amanita muscaria L. "Fly Agaric"
Agaricaceae
Temperate areas throughout the world
Under birch, pine beech, and larch trees in forests
Gilled mushroom appearing quite red-orange in the button stage and maturing into fungus 8–10 cm in height with an equally broad cap turning tan with white flecks on the hymen at maturity.
Hallucinogen
Ibotenic acid and muscimole

Anadenanthera colubrina (Vell.) Brenan "Vilca," "Cebil"
Mimosaceae
Peru, Bolivia, Argentina
Forests
A tree, often attaining a height of 30 m; leaves compound, 12–20 cm long, pinna pairs, 7–35, leaflets, 20–80 pairs; flower heads globose, white to yellow to orange; pods 10–32 cm long, 8–16 seeded.
Hallucinogen
N, N-dimethyltryptamine, and related tryptamines

Anadenanthera peregrina Speg. (*Piptadenia peregrina* Benth.) "Yopa," "Cohoba," "Parica"
Colombia, Venezuela, Brazil
Forests
A shrub or tall tree, 3–27 m; leaves compound, 10–20 cm long, pinna pairs 10–30 or more, leaflets, 25–80 pairs; flower heads globose, axillary, greenish white to yellowish; pods 5–30 cm long, 8–16 seeded.
Hallucinogen
N, N-dimethyltryptamine, and related tryptamines

Arctostaphylos uva-ursi L. "Bear-berry," "Kinnikinnick"
Ericaceae
Circumpolar, with its varieties
On sandy or rocky soil
Prostrate shrub forming mats to 1 m across; leaves evergreen, leathery, oblanceolate to oblong-obovate, 1–2 cm long; flowers urn-shaped, whitish fruits, round, bright red and mealy inside.
Hypnotic
Arbutin and ericolin (these do not explain the narcotic effects)

Areca catechu L. "Betel Nut," "Areca Nut"
Palmae
India, Malaya, Polynesia
Ubiquitous on South Pacific Islands
A slender tree to 25 m; trunk ringed; leaf blades to 1 m across with many pinnae; inflorescence conspicuous, much-branched; fruit ovoid, orange-scarlet, to 5 cm long.
Slight stimulant
Arecoline

Argemone mexicana L. "Prickly Poppy"
Papaveraceae
Southwestern United States, Mexico
Dry soil in fields and along roadsides
Coarse, prickly, herbaceous perennial with yellow sap; leaves spiny, 10–15 cm long; flowers bright yellow, many stamens; fruit a prickly capsule.
Questionable hallucinogen
Imperfectly known

Argyreia nervosa (Burm.) Bojer. "Silver Morning-glory," "Hawaiian Baby Wood Rose"
Convolvulaceae
Tropical Asia; pantropic in cultivation; used in Hawaii
Semi-forested areas: vine
A coarse silvery liana with cordate leaves to 12 cm long and almost as broad; branches, undersides of leaves and outer surface of corolla covered with silvery-white hairs; corolla funnelform, pale-violet-pink within; fruit a capsule with persistent spreading sepals.
Hallucinations
Ergolines (amides of lysergic acid)

Artemisia absinthium L. "Wormwood," "Absinth"
Asteraceae
Most of Europe, except the islands
Rocks, screes, uncultivated ground
Much-branched, aromatic, silvery perennial with finely divided leaves with silky hairs on both sides; flowers borne in lateral clusters to form a branched pyramidal inflorescence.

Hypnotic; dream delirium
Coumarins, absinthin, absinthol

Atropa belladonna L. "Deadly Nightshade," "Belladonna"
Solanaceae
Central and southern Europe, southwest Asia, Algeria
Wooded hills in shaded areas
A suffrutescent, perennial herb, to 1.5 m tall; leaves ovate, paired, one leaf of each pair larger than the other, 6–18 cm long; flowers bell-shaped, pendant, dingy purple tinged with green; fruit a many-seeded shiny black berry
Hallucinogen
Atropine and scopolamine

Banisteriopsis caapi Morton "Ayahuasca," "Caapi," "Yajé," "Natem pinde"
Malpighiaceae
Brazil, Colombia, Ecuador, Peru
Rain forest

A liana with lenticellate bark; leaves ovate to lanceolate, about 17 cm long, 609 cm wide; flowers in axillary panicles, carmine-pink, petals quick falling; fruit a reddish-brown samara.
Hallucinogen
Harmine, harmaline, d-tetrahydroharmine (tryptamines in *B. rusybana*)

Boletus (Tubiporus) Reayi Heim "Nonda ngam-ngam"
Polyporaceae
New Guinea (Wahgi Valley)
Forest (especially growing under *Castanopsis acuminatissima*)
A fleshy fungus with a spongy or porous underside to the cap; the tubular stratum peeling from the upper portion of the cap with some ease; cap from 8–25 cm broad and stipe 2–4 cm thick.
Hallucinogen (?)
Unidentified

Brunfelsia tastevini Benoist "Keya-honé"
Solanaceae
Brazil
Rain forest
A scandent shrub, sometimes a liana; leaves lanceolate, 6–15 cm long; flowers in terminal cymes; corolla tubular, yellowish-white; fruit a berry.
Hallucinogen
Imperfectly known; possibly tropanes, coumarins and the alkaloid scopoletin

Calliandra anomala (Kunth) Macbride "Cabeza de Angel"
Mimosaceae
Mexico and Guatemala
In level or mountainous places and sometimes along streams
A shrub, 1–4.5 m high; bark blackish, leaves compound with numerous leaflets, 2.5–5 mm long; flowers showy, purple-red, the stamens long-exserted; pod densely hirsute.
Hypnotic
Unidentified principle found in the resins

Calea zacatechichi Schlecht. "Thle pela kano"
Asteraceae
Mexico and Guatemala
Level places or hillsides
A multi-branched shrub, to 1 m tall; leaves broadly ovate-triangular, 2–6 cm long; flowers in dense cymose-umbellate panicles, rays white; fruit an achene, 1 mm long.
Hallucinogen (primarily visual)
Unidentified coumarins and lactones

Canavalia maritima (Aubl. Thouars) "Bay Bean," "Frijol de Mar"
Fabaceae
Pantropical shore plant
Beaches and seaside dunes
Trailing vine; leaves trifoliolate, obovate to suborbicular; flowers racemous, rosy-purple; fruit a legume prominently ribbed on each side of the upper suture.
Euphoriant similar to *Cannabis*
1-Betonicine

Cannabis indica Lam. "Bhang," "Hashish," "Ganja," "Hasheesh"
Cannabaceae
India, Pakistan, Iran, etc. (cultivated in many areas)
Waste places, cultivated in many areas
Densely branched shrub, rarely exceeding 3 m; leaves palmate, alternate; stems rounded (short fibers in phloem); seeds small, globose, heavily marbled. Alternate branching.
Mild euphoria to vivid hallucinations
Delta-1-tetrahydrocannabinol and isomers

Cannabis ruderalis Jan. "Weedy Hemp"
Cannabaceae
Southeast Russia
Cultivated fields
Unbranched shrub; not exceeding 1.5 m in height; similar to *C. sativa* but differing in its smaller size, its achene with a marbled surface, distinctly articulated at the base and easily detached.
Mild euphoria or no effects
Delta-1-tetrahydrocannabinol

Cannabis sativa L. "Hemp," "Pot," "Grass," "Marihuana," etc.
Cannabaceae
India, cosmopolitan
Waysides, disturbed places
A coarse, strong-smelling, glandular erect annual or perennial, to 14 m tall; leaves palmate with 3–9 lance-shaped, toothed segments; flowers dioecious, the staminate in long-panicled racemes, pistillate in short leafy axillary glomerules; fruit an achene. Opposite branching.
Mild euphoriant
Delta-1-tetrahydrocannabinol

Casimiroa edulis La. Lla. v. "Zapote Blanco," "Cochiztzapotl"
Rutaceae
Mexico
Mountain forests; often cultivated

Large tree with a broad dense crown; leaflets 5, elliptic to broadly ovate; flowers small, greenish white; fruit a globose drupe, yellowish with sweet pulp.
Sedating hypnotic
N-benzoyltyramine, methylhistamine, casimiroin, fagarine, and casimirodine

Catha edulis (Vahl) Forsk. "Khat"
Celastraceae
Arabia
Forest or woodland
A shrub or tree, 2–15 m tall; leaves oblong to elliptic, 5.5–11 cm long; flowers in axillary cymes, small, greenish-yellow; fruit capsular with 1–3 seeds.
Stimulant leading to hallucinations; terminating in somnolence
Ephedrine

Catharanthus roseus Don. "Madagascar Periwinkle"
Apocynaceae
Originating in Madagascar, now cosmopolitan; used in United States
Grows in a wide variety of soils, exposures, and climate
Erect everblooming herb or subshrub, 12–25 cm high; leaves oblong, 2–6 cm long; flowers white, rosy-purple or lavender with reddish eye, to 3 cm across; corolla tube narrow, 2 cm long.
Hallucinogen (highly toxic)
Ibogaine-like alkaloids

Cimicifuga racemosa L. "Black Cohosh"
Ranunculaceae
Much of the Eastern USA
Moist or dry woods
Tall perennial herb, 1–2 m high, with large, ternately and pinnately decompound leaves; leaflets coarsely and sharply toothed; inflorescence, a many-flowered, simple, or branched raceme; flowers small, petals lacking; fruit a follicle with roughened seeds.
Hypnotic
Cimicifugin (imperfectly characterized)

Cineraria aspera Thunb. "Mohodu-wa-pela"
Asteraceae
South Africa
Sunny, well-drained slopes
A suffrutescent perennial 0.5 m or more tall; stems, leaves and flowers heads white woolly-floccose; leaves runcinate-pinnatified, 4–8 cm long; flower heads yellow.
Hallucinogen of questionable status
Unknown

Claviceps purpurea (Fries) Tulasne "Ergot"
Hypocreaceae
North temperate regions of the world
Parasite of rye flowers
Infected rye flowers produce a sclerotium of mycelium supplanting the ovary turning dark purple.
Hallucinogen
Ergine, ergonovine, ergotamine, etc. (numerous alkaloids)

Coffea arabica L. "Arabian Coffee"
Rubiaceae
Arabia, Tropical Africa
Shrub areas on hillsides
A shrub or a small tree, 3–5 m tall; leaves elliptic, 6–12 cm long, glossy; flowers white, in axillary clusters; fruit a 2-seeded deep crimson berry.
Stimulant
Caffeine

Cola nitida (Vent.) Schott. & Endl. "Cola Nut"
Sterculiaceae
Senegal to Nigeria, Sierra Leone, Ghana, Ivory Coast
Forest
A tree, 10–25 m tall; leaves variable, often obovate, 12–16 cm long; flowers whitish or pale-yellow with dark red stripes; fruits of 5 recurved follicles with as many as 10 seeds in 2 rows.
Stimulant
Caffeine

Coleus blumei Benth. "El Macho," "El Nene," "El Ahijado"
Labiatae
Southeast Asia (cultivated in Mexico)
Damp shady places
A perennial herb or sub-shrub, to 1 m tall; leaves toothed, ovate, variously colored, 4–8 cm long; flowers blue, in branched racemes; corolla to 12 mm long; fruit a nutlet.
Hallucinogen (?)
Unidentified

Conocybe sp. "Magic Mushroom"
Agaricaceae
Narcotic sp. Mexico
Fields, gardens, bare soil, mosses, greenhouses, decayed wood, charcoal, anthills, dung, etc.
Pileus hygrophanous, glistening when dry; veil none; spores deep, rich rust color; stipe straight and central, elongate and thin, rarely thick or fleshy, often villous or pubescent; lamellae usually at first strongly adscendate.
Hallucinogen
Psilocybin

Coriaria thymifolia Humb. & Bonpl. "Shanshi"
Coriariaceae
Ecuadorian Andes
Mostly on steep cliffs or terraces
A slender shrub, 1–3 m tall, with distichous leaves on short lateral branches, all spreading in one plane, 1–2 cm long; flowers tiny in slender racemes; fruits dark-purple, 3–4 mm in diameter, juicy.
Hallucinogen giving a sensation of flight
Sesquiterpenes: coriamyrtine, coriatine, tutine, and pseudotutine

Cypripedium calceolus L. var. *pubescens* Willd. (Correll) "Yellow Ladyslipper"
Orchidaceae
Northeastern Canada, south to Georgia, west to Arizona and New Mexico
Shaded woods
Terrestrial orchid to 20 cm tall; leaves 3–5, somewhat 2-ranked, plicate, sheathing the stem; flowers showy, large; inflated lip dull to bright yellow outside, spotted dark red or purple on the inside.
Hypnotic, sedation, and lassitude
Unidentified

Cytisus canariensis (L.) (*Genista canariensis* L.) Kuntze "Canary Island Broom"
Fabaceae
Canary Islands. Naturalized in California, Mexico
Rocky hillsides, dry places, heaths, etc.
An evergreen, much-branched shrub to 2 m; leaves 3-foliate, small; flowers in many-flowered racemes, bright-yellow, petals 12–14 mm long; pod 12–20 mm long, pubescent.
Mild hallucinogen
Cytisine

Datura candida (Pers.) Safford "Maikoa," "Queen of the Night"
Solanaceae
South America (north)
Forested areas
Shrub or woody tree to 20 m, corolla tube white, 12–15 cm long; foliage oblanceolate, densely tomentose; branching dichotomus to sub-dichotomus; fruit a capsule.
Hallucinogen and hypnotic
Scopolamine, hyoscyamine, and atropine

Datura inoxia Mill. "Toloache"
Solanaceae
Mexico, southwestern United States
Dry open places, disturbed areas
Coarse, scandent annual; leaves ovate, 5–12 cm long; corolla tube white, 15–18 cm long, 10-toothed; capsules ovoid, 6–6.5 cm in diameter, spiny.
Hallucinogen and hypnotic
Scopolamine, hyoscyamine, and atropine

Datura metel L. (*D. fatuosa* L.) "Unmata"
Solanaceae
India; naturalized in the Mediterranean region
Waste places, river sands
Pungent, densely hairy, grayish annual to 1.5 m long; leaves entire or shallowly lobed; flowers large, 18–24 cm long, white often flushed with pink; fruit pendulous, spiny.
Hypnotic and hallucinogen
Scopolamine, meteloidine, hyoscyamine, norhyoscyamine, norscopolamine, cuscohygrine, and nicotine

Datura sanguinea R. & P. "Huanto"
Solanaceae
Peru
Highlands
A tree-like shrub, 1–4 m tall; leaves clustered, narrow-oblong, to 15 cm long; flowers tubular, pendulous, orange-red with yellow nerves; fruit a turbinate capsule, to 6 cm long.
Hallucinogen and hypnotic
Scopolamine, hyoscyamine, and atropine

Datura stramonium L. "Jimsonweed"
Solanaceae
Cosmopolitan
Waysides, disturbed places, etc.
An erect, few-branched annual; leaves elliptic to ovate, 5–20 cm long; corolla tube white or pale-lavender, 5-toothed, 6–10 cm long; capsules ovoid, 3–5 cm in diameter, spiny or smooth.
Hallucinogen and hypnotic
Scopolamine, hyoscyamine, and atropine

Delphinium consolida L. (*Consolida regalis* S. F. Gray) "King's Consound"
Ranunculaceae
Most of Europe except the islands and the south, and most of the Balkan peninsula
Fields and dry places
Annual to 50 cm tall; leaf segments all linear; flowers dark or light blue.
Hypnotic
Delphinine, delphinedine, ajacine

Desfontainea spinosa v. *hookeri* (Dun.) Reiche "Taique," "Chapico"
Desfontaineaceae
Chile
Hillsides or highlands
A shrub, 1.5–2.5 m tall; leaves, holly-like, 5–7 cm long; flowers tubular, red tipped with bright yellow; fruit a yellowish berry.
Hallucinogen
Unidentified

Duboisia myoporoides R. Br. "Pituri"
Solanaceae
Australia
Forests
A shrub or tree to 12 m; leaves elliptic, 4–8 cm long; flowers white, tiny, bell-shaped, in terminal clusters; fruit a globular black berry.
Stimulant, secondarily a hallucinogen
Scopolamine, hyoscine

Elaeophorbia drupifera (Thonn.) Stapf. "Kankan," "Dodo"
Euphorbiaceae
Guinea, Sierra Leone
Forests and coastal plains
Tree-like succulent with a milky sap, branching above, to 5 m; branches slightly 5-angled; leaves obovate-elongate, 15–23 cm long; flowers in a cyathium, small.
Hallucinogen (?)
Unidentified principle in the latex

Elaphrium bipinnatum (DC) Schlecht. "Palo Copal"
Burseraceae
Mexico (south-central)
Dry places
A shrub or sometimes a small tree to 12 m tall; leaves fern-like, with numerous small leaflets; flowers tiny, whitish; fruit a small 3-angled drupe, containing a single seed.
Stuns without impairing motor coordination
Unidentified

Epilobium angustifolium L. "Fireweed"
Onagraceae
Circumboreal America and Eurasia
Moist soils rich in humus; abundant after fires
Tall perennial to 2 m; leaves numerous, lanceolate; flowers rosy-purple, many in a long, cylindrical, leafless terminal spike; fruit a 4-angled capsule.
Hypnotic used to fortify *Amanita muscaria*
Unidentified

Erythrina sp. "Coral-Tree"
Fabaceae
Southwestern United States and Mexico, Guatemala
Flat, dry areas
Woody shrubs to fairly large trees, usually spiny; leaves with 3 broad leaflets; flowers usually bright red or scarlet, showy, in dense racemes; fruit a long pod with bright-colored seeds.
Hallucinogenic stupor
Indoles and isoquinolines; imperfectly known erythrinanes

Erythroxylum coca Lam. "Coca"
Erythroxylaceae
Peru, Bolivia, Ecuador
Highlands
A densely leafy shrub, 1–2 m tall; leaves elliptic, strongly 3-veined, golden-green, 4–7 cm long; flowers axillary, white, small; fruit an orange-red drupe.
Euphoriant and stimulant
Cocaine

Foeniculum vulgare Mill. "Fennel"
Apiaceae
Southern Europe and southwest United States
Waste places, disturbed areas, waysides
A short-lived perennial, 1–2 m tall; leaves 3–4 pinnately compound with the ultimate segments thread-like, very aromatic; flowers in large greenish-yellow umbels.
Epileptiform convulsions and hallucinations
Unidentified oil distillate

Galbulimima belgraveana (F. Müll.) Sprague "Agara"
Himamtandraceae
Papua, New Guinea
Rain forest slopes
A tree to 15 m tall; leaves leathery, 9–14 cm long; branches and undersides of leaves covered with peltate scaly indumentum; flowers on short axillary branches, yellowish, many stamens; fruit gall-like, turning red with age, to 1 cm in diameter.
Hallucinogen; the narcosis progresses to an ultimate stupor or coma
Himbacine, polycyclic piperidine derivatives

Gelsemium sempervirens L. (Ait.) f. "Yellow Jessamine"
Loganiaceae
Southeastern United States
Thickets, woodlands, fence rows, and roadsides
Climbing or trailing vine; leaves evergreen, lanceolate to elliptic, 2–70 m long; flowers fragrant, bright yellow, usually solitary; fruit a capsule with many seeds.
Hypnotic
Gelsemine, gelseminine, gelsemoidine—all nerve poisons

Gnaphalium polycephalum Michx. (*G. obtusifolium* L.) "Sinjachu"
Asteraceae
Most of the eastern United States and Canada, south to Texas
Open sandy places
Annual or maybe biennial, fragrant herb to 1 m tall; leaves numerous, linear-lanceolate, green above, white woolly below; flowers in a many-branched, flat or round-topped, often elongate inflorescence.
Hypnotic
Unidentified

Gomortega keule Johnston "Keule," "Hualhual"
Gomortegaceae
Chile
Forest slopes
A large tree to 25 m; leaves aromatic, evergreen shiny; flowers in axillary and terminal racemes or panicles; fruit drupaceous with a bony endocarp, 2–3 seeded.
Hallucinogen or, possibly, irritant
Essential oils in the fruit

Gymnopilus spectabilis (Fr.) A. H. Smith (*Pholiota spectabilis* Fr.)
"Waraitake," "Maitake"
Agaricaceae
Widely distributed in the United States; also Japan
Earth, buried wood, stumps and logs of hardwoods and conifers
Pileus convex, nearly flat in age, dry, buff, yellow to yellow-orange, hairless or hairy in age; spores orange or rusty-orange; lamellae adnate to short decurrent, crowded, mustard-yellow to orange-buff; stipe to 20 cm long, same color as pileus above, sometimes club-shaped; veil membranous, persistent.
Hallucinogen
Unknown

Heimia salicifolia (HBK) Link & Otto "Sinicuichi"
Lythraceae
Texas, Mexico, and Central America
Along streams
A spreading, branched shrub to 3 m; leaves linear-lanceolate, 2–5 cm long; flowers yellow, petals early deciduous; fruit an obovoid ribbed capsule.
Hallucinations, primarily auditory; vision suffused with yellow
Sinicuichine, cryogenine

Homalomena ereriba Schott.
Araceae
Papua, New Guinea
Rain forest slopes
Terrestrial herb from short rootstock; leaves dark-green above, paler beneath; spathe greenish.
Questionable, admixture to *Galbulimima belgraveana*
Unidentified

Humulus lupulus L. "Hop"
Cannabaceae
Europe, Asia, North America
Hedges, damp places, cultivated
Climbing perennial vine; leaves oval, 3–5 lobed, toothed, 10–15 cm long; flowers dioecious, male inflorescences branched, pendulous, female stalked, cone-like; fruit an achene in cone-like clusters
Sedating, soporific
Unidentified principles in the resins

Hyoscyamus niger L. "Henbane"
Solanaceae
Europe
Waste places, waysides, sandy areas
A coarse, sticky, hairy biennial or annual, 20–80 cm tall; leaves oblong, 15–20 cm; flowers dull-yellow with a network of purple veins; fruit a capsule enclosed by the papery calyx.
Hallucinogen and sedative
Hyoscyamine and scopolamine

Ilex cassine L. "Dahoon," "Black Drink"
Aquifoliaceae
Southeastern United States
Cypress ponds and bogs
Large shrub or small tree; leaves elliptic to lanceolate, coriaceous, 28 cm long; staminate flowers in short, axillary compound cymes; pistillate flowers solitary or in 3-flowered cymes; fruit drupaceous, bright red.
Hypnotic
Unknown

Ilex paraguayensis St. Hil. "Maté"
Aquifoliaceae
Brazil, Argentina, Paraguay
Near streams
An evergreen shrub or small tree to 7 m; leaves serrate, elliptic-obovate, 2.5–8 cm long; flowers tiny, white, in axillary clusters; fruit a reddish berry.
Stimulant
Caffeine

Iochroma fuschioides (H. B. K. Miers) "Borrachero"
Solanaceae
Andean area of Ecuador
Forests
Large shrub to 2 m or more; leaves glabrous, ovate, 5–12 cm long; flowers orange-scarlet, tubular, 5 cm long.
Hallucinations
Unidentified

Ipomoea violacea L. (*Ipomoea rubro-coerulea* Cav.) "Quiebra Plata"
Convolvulaceae
Mexico
Hillsides, most thickets, etc.
A twining vine; leaves cordate-ovate, to 7 cm long and nearly as wide; corolla funnelform, violet-blue to reddish-purple; fruit a several-seeded capsule.
Hallucinogen
Amides of lysergic acid

Justicia pectoralis Jaq. v. *stenophylla* Leonard "Bolek-hena"
Acanthaceae
Venezuela, northern Brazil
Forests
An erect herb to 20 cm tall; leaves narrowly lanceolate; 2–6 cm long; flowers purple, white, or lilac, in elongate, mostly one-sided spikes; fruit capsular.
Hallucinogen
Tryptamines (?)

Kaempferia galanga L. "Maraba"
Zingiberaceae
New Guinea
Usually in open grassy areas
A smooth stemless herb arising from a tuberous aromatic rootstock; leaves orbicular, spreading horizontally, 7–15 cm long; flowers white or pale-pink with violet spot prominent.
Hallucinogen
Unidentified principle in volatile oils of the rhizome

Lactuca quercina L. "Wild Lettuce"
Asteraceae
Central and eastern Europe from Bulgaria north to central Germany and south-coast Russia
Woods and scrubland
Erect annual or biennial to 1.5 m tall with thin leaves, sagittate-amplexicaul base; flowers yellow in a dense corymbose panicle.
Hypnotic
Lactucarium

Lactuca virosa L. "Wild Lettuce"
Asteraceae
Central and southern Europe
Waysides, uncultivated ground, rocky places
Stiff, erect biennial to 1.5 m tall with the blades of the stem leaves held horizontally; leaves lobed or toothed, sometimes entire; flowers yellow in a lax, much-branched leafless inflorescence.
Hypnotic
"Lactucarium," an imperfectly characterized complex from the laticifers of the plant.

Lagochilus inebrians Bunge. "Intoxicating Mint"
Lamiaceae
Central Asia, Russia
Steppes
A shrub to 1 m tall, leaves 3-lobed, each lobe spine-tipped, pubescent; 1.5–2.5 cm long; calyx spiny, ribbed; corolla white, covered with silvery hairs; fruit a nutlet.
Tranquilizer (hallucinogen ?)
Lagochiline and/or a polyhydric alcohol

Latua pubiflora (Gris.) Phil. "Latue"
Solanaceae
Chile
Moist shaded areas
A spiny shrub or small tree, 3 m or more high; leaves lanceolate, 4–6 cm long; flowers violet, axillary; fruit a lemon-yellow berry.
Hallucinogen
Atropine and scopolamine

Leonorus sibricus L. "Siberian Motherworth," "Marahuanilla"
Lamiaceae
Endemic to Siberia and China; naturalized in the eastern United States, tropical America, and the Gulf Coast
Waste places
Biennial with stems to 1.5 m tall; leaves broadly ovate to rotund in outline, deeply 3-parted, laciniately toothed; flowers in axillary whorls subtended by bracteal leaves and linear bracts, pink; plant strong-scented.
Euphoriant and hypnotic
Leonurine

Leonotis leonurus R. Br. "Lion's Ear," "Lion's Tail," "Dagga," "Twalainoyani"
Lamiaceae
South Africa
Grassland
Branched shrubby perennial, 1–2 m tall, leaves lanceolate, 4–12 cm long, serrate; flowers in dense axillary whorls, bright orange-red, pubescent; fruit consisting of four nutlets.
Mild euphoriant
Unidentified resins from the inflorescence

Lobelia tupa L. "Tupa," "Tabaco del Diablo"
Lobeliaceae
Chile
Wooded slopes, in open and among shrubs
A stately perennial herb, 1.5–2.5 m tall; leaves lanceolate, 16–20 cm long; flowers bright scarlet-red, in long terminal racemes; fruit a capsule.
Hallucinogenic stupor
Lobeline and its keto- and dihydroxy derivatives

Lophophora williamsii (Lem.) Coult. "Peyote," "Mescal Button"
Cactaceae
Texas, north Mexico
Deserts
A small, globose cactus with a carrot-shaped taproot, c. 4 cm high and 6–10 cm in diameter; surface blue-green; flowers small, pale-pink or white.
Hallucinogen
Mescaline and over thirty phenylethylamines and simple isoquinolines

Lycoperdon marginatum Heim "Gi'-i-sa-wa"
Lycoperdaceae
Oaxaca, south, around San Miguel (Mixtec)
Above 2000 m in mountain meadows
"Puffball" with a membranous peridium and a dense white interior when immature; at maturity the interior darkens and crumbles to a dark mass of spores; opening by apical perforations.
Hallucinogen
Unidentified alkaloid in mature spores (psilocybine (?), Ibotenic acid (?)

Lycopodium selago L. "Fir Clubmoss"
Lycopodiaceae
With its varieties, circumpolar
Woods, bogs and heaths
Stems short, ascending and divided regularly into branches of equal length; leaves imbricate, in many rows along the stem.
Hypnotic
Lycopodine (?)

Mandragora officinarum L. "Mandrake," "Mandragora," "Satan's Apple"
Solanaceae
Southern Europe
Stony places, deserted cultivation
A perennial with a stout, often branched taproot to 1 m long; leaves in a basal rosette, to 25 cm long; flowers violet, bell-shaped, on a short stalk, 2–5 cm high; fruit a round, smooth, deep-yellow berry.
Hallucinogen; followed by a death-like somnolence
Scopolamine, hyoscyamine, mandragorine, and atropine

Methysticodendron amesianum Schultes "Culebra-Borrachera"
Solanaceae
Southern Colombia
Forested mountain areas
A tree to 5 m; leaves long-linear, crenulate, 12–25 cm or more; flowers long-tubular, to 25 cm or more; white.
Hallucinogen
Hyoscyamine, norhyoscyamine and scopolamine

Mimosa hostilis Benth. "Vino de Jurema"
Mimosaceae
Brazil
Forests
A viscid puberulent shrub; leaves compound pinnate; flower's spikes c. 2.5–5 cm long; corolla 4-parted, 8 stamens; legume viscid puberulent, flat.
Hallucinogen
Unidentified

Mirabilis multiflora (Torr.) Gray "So'ksi"
Nyctaginaceae
Arizona, Utah, New Mexico, Texas and northern Mexico
On hillsides and mesas, often among rocks and shrubs
An herbaceous perennial, somewhat scandent; leaves ovate, to 4 cm long; corolla tube often exceeding 4.5 cm, purple-red, generally more than 3 flowers in each involucre; fruit a ribbed achene.
Hallucinogen (?)
Unidentified

Mitchella repens L. "Partridge Berry"
Rubiaceae
Eastern United States, Canada, Mexico, and Japan
Dry or moist woods
Trailing perennial, forming mats; stems rooting at the nodes; leaves evergreen, round-ovate, less than 2 cm long; flowers in pairs, mostly terminal, small, white or tinged pink; berry red.
Hypnotic
Unidentified

Mitragyna speciosa Korth. "Kutum," "Kratom," "Mambog"
Rubiaceae
Malay peninsula
Open country
A large tree, 12–16 m tall; leaves oblong-ovate, 8–12 cm long; flowers in globose heads of 3, deep-yellow; seeds winged.
Hallucinogen
Mitragynine and eight similar compounds

Monadenium lugardae N. E. Br. "Tshulu," "Mhlebe"
Euphorbiaceae
South Africa
Arid plains; open places
Fleshy succulent with a tuberous root, 12–60 cm high; leaves terminally crowned, spatulate, 1.5–9 cm long; flowers in solitary cymes, greenish; fruit a 3-angled capsule.
Hallucinogen
Methylamines (uncertain)

Monotropa uniflora L. "Corpse Plant," "Indian Pipe"
Monotropaceae
Most of the United States and Canada south to Central America
Rich woods in leaf-mold
Saprophytic plant lacking chlorophyll, to 25 cm tall; leaves reduced to scales; flowers urceolate, white, nodding and solitary.
Hypnotic
Undetermined

Myristica fragrans Houtt. "Nutmeg"
Myristicaceae
Moluccas, Banda Islands, Malayan archipelago
Open areas of the tropics
A tree to 8 m tall; leaves elliptic, 8–12 cm long; flowers dioecious, small; fruit a pendulous globose drupe, splitting into 2 valves disclosing the scarlet aril or mace surrounding the seed which is encased in a hard shell.
Hallucinogen
The oils myristicin and elemecin (a fraction of the former)

Nanathus albinotus (Haw.) Bol. [*Rabiea albinota* (Haw.) Br.] "S'Keng-keng"
Aizoaceae
South Africa
Dry open places
Dwarf, compact succulent; leaves fleshy, sabre-shaped, 3-angled above, covered with whitish flecky prominent dots; flowers yellowish.
Hallucinogen
Unidentified

Nicotiana rustica L. "Turkish Tobacco"
Solanaceae
Eastern United States
Waste places, open areas, etc.
A strong-smelling, glandular, hairy annual, 30–100 cm tall; leaves stalked, ovate-cordate, 6–10 cm long; flowers in dense terminal clusters, greenish-yellow; fruit a many-seeded capsule.
Protoplasmic poison and retardant to neural transmission
Nicotine primarily, harman

Nicotiana tabacum L. "Tobacco"
Solanaceae
Of hybrid and tetraploid origin. Brazilian progenitors
Cultivated
An erect, acrid annual, 1–2 m tall; leaves clasping, ovate-lanceolate, 20–45 cm long; flowers pale-pink or purple, in terminal clusters; fruit a many-seeded capsule.
Protoplasmic poison and retardant to neural transmission
Nicotine primarily, harman

Nymphaea ampla (Salisb.) D. C. "Quetzalaxochiatl," "Precious Water-lily," "White Water-lily"
Nymphaeaceae
Tropical and subtropical America from Mexico to Brazil
Aquatic perennial with submerged rootstocks and floating leaves
Leaves sub-orbicular, to 4 cm across, with sinuate margins; flowers white, 12 cm in diameter, with 7 to 21 petals.
Hypnotic and hallucinogen
Aporphine (an apomorphine-like alkaloid), nupharine, nupharidine

Nymphaea caerulea Sav. "Sacred Lily of the Nile," "Blue Water-lily"
Nymphaeaceae
Northern and central Africa
Aquatic perennial with submerged rootstocks and floating leaves
Leaves sub-orbicular, 1–1.5 m in diameter, with more or less entire margins, purple-spotted beneath; flowers 9–18 cm in diameter, pale blue with a white center open only in the forenoon for 3 days.
Hypnotic and hallucinogen
Nupharine, nuciferine, nupharidine and possibly aporphine

Olmedioperebea sclerophylla Ducke "Rape dos Indios"
Moraceae
Brazil
Rain forests
A large tree, 25–35 m tall; leaves ovate, 20–30 cm long; male and female flowers borne in separate receptacles, small; fruit a drupe, 2–2.5 cm in diameter.
Hallucinogen
Undetermined

Pancratium trianthum Herb. "Kwashi"
Amaryllidaceae
West Africa
Open places
Perennial arising from a globose-ovoid bulb; leaves linear, flaccid, elongate; flowers whitish with a broad pink band up the outer lobes, the tube 12–15 cm long.
Hallucinogen
Unidentified

Paneolus papilionaceus Fr. "Waraitake," "Maitake"
Agaricaceae
Eastern United States and Canada, Japan
Soil and rich dung
Pileus somewhat fleshy, at first hemispherical, sometimes subumbonate, the cuticle breaking up into scales when dry, pale-gray with a tinge of reddish-yellow, c. 2.5 cm broad; lamellae broadly attached to the stipe, black; stipe to 10 cm long, slender, firm, hollow, whitish, sometimes with red or yellow tinge.
Hallucinogen
Probably psilocybin and psilocin, both of which are present in *Paneolus sphinctrinus*

Passiflora incarnata L. "Coanenepilli," "Serpent's Tongue"
Passifloraceae
Southeast United States
Fields, roadsides, fence rows, and thickets

Trailing or climbing vine to 2 m long; leaves palmately 3-lobed; flowers axillary, solitary, bluish-white, the corona segments lavender-white, banded with purple; fruit a green or yellow berry to 7 cm long.
Euphoriant and hypnotic
Passicol, harmol, harman, harmine, harmalol, and harmaline

Passiflora jorullensis H.B.K. "Coanenepilli"
Passifloraceae
Mountains of central and southern Mexico
Forests
Trailing or climbing vine; leaves bilobed or trilobed one-third of their length, the lobes rounded or subacute, mucronulate, 6 cm long; flowers in axillary pairs, orange-red, small; fruit globose, 5 cm in diameter, lustrous black.
Euphoria similar to *Cannabis*
Passicol, harmol, harman, harmine, harmalol, and harmaline

Papaver somniferum L. "Opium Poppy"
Papaveraceae
Central Europe, the Levant
Fields, waysides, waste places
An erect glaucous annual, 0.5–1.5 m tall; leaves clasping, 7–12 cm long, deeply toothed; flowers to 10 cm across, white, lilac, or purple with or without dark basal blotch; fruit a capsule with many seeds.
A feeling of well-being
Morphine, codeine, and twenty-four other alkaloids

Paullinia cupana H.B.K. "Cupana," "Guarana"
Sapindaceae
Brazil
Forests
A scandent or sub-erect liana; leaves compound, 5-foliate, 10–20 cm long; flowers white, tiny, in panicles; fruit an apiculate capsule, dark red in maturity; seed dark brown.
Stimulant
Caffeine

Peganum harmala L. "Syrian Rue," "Zit-el-Harmel"
Rutaceae
Turkey, Syria
Waste places, steppes
An erect perennial herb, 30–70 cm tall; leaves finely dissected into linear segments, 3–5 cm long; flowers solitary, white; capsules slightly stalked.
Hallucinogen
Harmine and related indoles

Pernettya furens (H. & A.) Kl. "Huedhued," "Hierba Loca"
Ericaceae
Chile
Open fields or clearings in woods
A shrub, 1–1.5 m tall; leaves ovate, 2.5–5 cm long, finely serrate; flowers urn-shaped, white, in short nodding racemes; fruit a many-seeded berry enclosed by the persisting calyx.
Hallucinogen
Possibly andromedotoxine and/or arbutin

Pholiota spectabilis Fr. *(Gymnopilus spectabilis)* "Waraitake," "Maitake"
Agaricaceae
Southern Canada, mountains of western United States, central and eastern states, Japan
Decayed oak stumps
Stipe, 7–10 cm tall, thick, tough, spongy and thickened toward the base; pileus, compact, convex, then plane, dry, torn into silky scales which disappear toward the margin, golden-orange in color; gills, narrow, crowded, yellow then ferruginous.
Hallucinogen
Unidentified

Phytolacca americana L. "Pokeweed"
Phytolaccaceae
Much of the eastern United States
Waste ground and pastures, usually disturbed habitats
Robust perennial to 2 m tall with one to many stems from the root crown; roots thick and fleshy; leaves lanceolate, entire, 4–11 cm long; flowers racemose, green to whitish; berry purplish-black at maturity.
Hypnotic, may induce respiratory failure
Phytolacine

Piper betel L. "Betel"
Piperaceae
Southeast Asia, Polynesia
Shaded wooded areas
A glabrous climbing vine; leaves fleshy, ovate, 10–14 cm long; male spikes cylindric, female spikes to 4 cm long; fruit a drupe.
Unknown (additive to *Areca*)
Unidentified

Piper methysticum Forst. "Kava Kava"
Piperaceae
Polynesia, Sandwich Islands, South Sea Islands
West forests
A shrub, 1.5–4 m tall; leaves cordate-ovate, 13–22 cm long and almost as wide; flowers dioecious in densely flowered short spikes.
A state of well-being followed by somnolence
Marindin, dihydromethylsticin, and others

Psilocybe sp. "Magic Mushroom"
Agaricaceae
Narcotic sp. (Sect. Caerulescentes) Mexico and Central America
Sticks, stems, mud, peat, earth, humus, deep moss beds, dung, sawdust, straw, or dead wood
Pileus cylindric conic or semiglobate to convex, campanulate, often umbonate or papillate, viscid or dry; spores deep lilac to sepia; stipe not viscid, glabrous or with a fibrillose coating; lamellae broad, adnexed to adnate; a few species annulate.
Hallucinogen
Psilocybin and psilocin

Psychotria viridis R. & P.
Rubiaceae
Ecuador, Peru
Forests, western Amazon
A shrub or small tree to 4.5 m tall; leaves obovate or ovate-oblong, 6–9 cm long; inflorescence spicate-paniculate, many flowered; flowers whitish, minute; fruit baccate, red.
Hallucinogen
N,N-dimethyltryptamine

Rauvolfia tetraphylla L. (*Rauvolfia canescens* L.) "Pinque-pinque"
Apocynaceae
Central and northern South America, West Indies
Savannahs
Shrub to 1 m tall; leaves usually in whorls of four, the members of a whorl unequal, ovate, 4–12 cm long; flowers in axillary and terminal cymes, greenish-white, tiny; fruit a red drupe, becoming black.
Tranquilizer
Reserpine (?)

Rauvolfia serpentina (L.) Bth. "Sarpaganda"
Apocynaceae
India, Malaysia
Sunny or shaded, periodically dry localities
Shrub to 1 m tall; leaves oblong or elliptic, 7–25 cm, usually 3-verticillate; flowers in cymes, corolla tube slender, reddish-pink; fruit a globose black drupelet.
Tranquilizer
Reserpine

Rhyncosia longiracemosa Mart. & Gal. "Piule"
Fabaceae
Southern Mexico
Moist wet thickets or forest, often on limestone
An herbaceous vine, varying in size; leaves 3-foliate, leaflets, 4–7 cm long; flowers in long many-flowered racemes; corolla wings yellow, standard reddish-brown; pod contains small, compressed dark-brown seeds.
Hallucinogen
Cystine

Rhyncosia pyramidalis (Lam.) Urban "Piule"
Fabaceae
Southern Mexico, Guatemala
In wet to dry thickets
An herbaceous vine, varying in size; leaves 3-foliate leaflets, 3–12 cm long; flowers in racemes; corolla reddish-yellow; pod contains scarlet seeds with a black end.
Hallucinogen
Cystine

Rivea corymbosa Hall. [*Turbina corymbosa* (L.) Raf.] "Ololiuqui"
Convolvulaceae
Mexico
Moist or wet thickets, often weedy in hedges
A large to small woody vine, often climbing over small trees; leaves ovate-cordate, 4–10 cm long; flowers funnelform, white, in dense panicles; fruit a 1-seeded capsule.
Hallucinogen
Ergine, isoergine and minor alkaloids

Salvia divinorum Epl. & Jativa "Pipiltzintzintli"
Lamiaceae
Mexico
Moist places in ravines
A perennial sprawling herb, to 3 m or more; leaves ovate, 12–15 cm long; flowers white, subtended by violet bracts, verticillate on an inflorescence 30–40 cm long; fruit a nutlet. Originally described by Epling as having blue flowers.
Hallucinogen
Unidentified (in study by Sandoz Laboratories)

Sarcostemma acidum Voight (*Sarcostemma brevistigma* W. & A.) "Soma"
Asclepiadaceae
India
Stony places
A twining, leafless sub-shrub; branches cylindrical; flowers in umbels terminating short lateral branches, greenish-white; fruit a bivalved follicle; seeds comose.
Hallucinations and giddiness
Undetermined

Sceletium expansum (L.) L. Bol. "Khana"
Aizoaceae
South Africa
Dry open places
A prostrate shrub to 30 cm high; leaves 4 cm long, lanceolate, persisting after withering as skeletons; branches and leaves covered with fine papillae; flowers dull yellow, many petals.
Hallucinogen (?)
Mesembrine and mesembrenine

Sclerocarya caffra Sond. "Marula"
Anacardiaceae
South Africa
Lowveld
A branched tree to 18 m; leaves compound, 7–13 foliate, 15–30 cm long; flowers dioecious, male inflorescences in racemes, female solitary; fruit a yellow, plum-sized drupe.
Hallucinogen (?)
Unidentified

Senecio hartwegii Benth. "Peyote de Tepic"
Asteraceae
West-central Mexico
Dry places
Shrub; branches, petioles and lower leaf surfaces tomentose; leaves suborbicular; 1–6 cm long, palmately 7–9 nerved, repand-angulate; flower heads yellow, small.
Neurotoxin producing delusions
Pyrrolizidine alkaloids

Solanum nigrum L. "Black Nightshade"
Solanaceae
Cosmopolitan weed, probably native of Eurasia
Waste places throughout; sometimes in moist ground
Annual, to 1.5 m tall, often widely branched; leaves thin, ovate-lanceolate, acuminate; inflorescences lateral from the internodes, umbelliform, 2–10 flowered; petals white or occasionally pale violet; berries globose black or dark yellow in var. *villosum*.
Neural poison
Solanine

Sophora secundiflora (Ortega) Lag. "Mescal Bean"
Fabaceae
Texas, New Mexico, and northern Mexico
Usually on limestone hills
Evergreen shrub or occasionally a tree to 9 m; compound leaves deep-green, 8–14 cm long; flowers in pendulous racemes, mauve-violet, very fragrant; pod to 10 cm long containing 1–8 red seeds.
Hallucinogen (highly toxic)
Cystine (ulexine, baptitoxine, sophorine)

Stipa vaseyi Scribn. [*S. robusta* (Vasey) Scribn.]
"Popoton Sacaton," "Sleepy grass"
Poaceae
Colorado to western Texas, Arizona, and northwestern Mexico
Dry plains and hills and dry open woods
Perennial grass to 1–1.5 m tall; panicle compact, larger than in *S. viridula*, plants robust; glumes firm with inconspicuous nerves.
Hypnotic
Unidentified

Stipa viridula Trin. "Green Needlegrass"
Poaceae
Central Canada, central and eastern United States, southwest to Arizona
Plains and dry slopes
Perennial grass to 1 m tall; panicle slender and loose, plants rather slender; glumes thin and papery.
Hypnotic
Unidentified

Stropharia sp. "Magic Mushroom"
Agaricaceae
Narcotic species in western United States, Mexico, Central and South America, Hawaii, etc.
Soil, foliage, dung; rarely on decayed wood or sawdust
Pileus viscid or humid, white or bright colored; spores deep lilac to blackish lilac (when fresh); stipe straight or somewhat flexous, longer than the diameter of the pileus, always annulate; lamellae (gills) adnexed to adnate; veil usually membranous.
Hallucinogen
Psilocybin and psilocin

Tagetes lucida Car. "Yauhtli," "Hierba de Nube"
Asteraceae
Mexico
Woods, hillsides, rocky slopes
Perennial aromatic herb, to 1 m tall; leaves lanceolate, finely serrate; flowers bright yellow in dense terminal cymes.
Benumbing (classic náhuatl use), confusion
Coumarins, lactones, and terpenes

Tabernanthe iboga Baill. "Iboga"
Apocynaceae
Gabon and parts of the Congo
Forests
Shrub 1–2 m tall; leaves lanceolate; opposite, to 14 cm long; inflorescence subumbellate; flowers white spotted pink, contorted in bud; fruit a berry; seeds with fleshy ruminate albumen; root yellowish.
Hallucinogen
Ibogaine

Tetrapteris methystica Schultes "Caapi-pinima"
Malpighiaceae
Brazil
Rain forest
A liana; leaves obovate to oblong, 1–3 cm long, light-green above, ash-grey beneath; flowers yellow with reddish markings; fruit a samara.
Hallucinogen
Imperfectly known; probably beta-carbolines

Thea sinensis L. (*Camellia sinensis* Kuntze) "Tea," "Cha"
Theaceae
China, India
Shaded areas
A shrub or occasionally a tree to 10 m; leaves elliptic, 4–10 cm long, leathery; flowers white, usually solitary; fruit a woody capsule.
Stimulant
Theine (caffeine)

Theobroma cacao L. "Cacao"
Sterculiaceae
Central and South America
Forests of high humidity
A wide-branching tree to 9 m; leaves oblong-oval or elliptic-oblong, to 25 cm long; flowers in fascicles on bark of trunk and main branches, small, yellowish; fruit a woody drupe with numerous seeds.
Stimulant
Theobromine (caffeine)

Trichocereus pachanoi Brit. & Rose "San Pedro"
Cactaceae
Ecuador
Mountain slopes
A tall columnar cactus, 3–6 m high, with numerous branches; flowers large, white, 19–23 cm long, borne near the tops of the branches, night-blooming, fragrant.
Hallucinogen
Mescaline primarily

Vaccinium uliginosum L. "Bog Bilberry"
Ericaceae
Circumboreal America and Eurasia
Bogs
Low, dense, much-branched undershrub to .75 m tall; leaves deciduous, elliptic, 3–7 cm long; flowers pink, in clusters of 1–4 from the axils of bud-scales; fruit dark blue or black.
Hypnotic
Unidentified neural toxin

Valeriana officinalis L. "Valerian"
Valerianaceae
Throughout Europe; naturalized in the United States
Damp places, wet meadows, woods, watersides
Robust perennial herb to 2 m tall; leaves compound, leaflets variable; flowers in dense, terminal, flat-topped, branched clusters, pale pink; stamens 3; fruit crowned with a pappus.
Hypnotic
Monoterpene valepotriotes

Vanda roxburghii R. Por. (syn. *V. tessellata*) "Tesselated Vanda"
Orchidaceae
Ceylon, India, and Burma
Epiphytic herb of wet forest
Stem, 80 cm tall; densely leafy; inflorescence suberect or ascending; flowers to 5 cm in diameter, usually with green petals and sepals mottled with brown, lip 3-lobed, violet purple.
Hypnotic; delirium and trance states
Unidentified

Veratrum album L. "White False Helleborine"
Liliaceae
Throughout most of Europe, except Great Britain
In hills and mountains, in pastures and damp grassy places
Robust, erect perennial to 1.5 m tall; leaves numerous, hairy beneath, strongly veined, in whorls of 3; inflorescence a large, branched, elongated terminal cluster; flowers white within, greenish outside, c. 5 cm across, spreading like a star.
Hypnotic
Veratrine and protoveratrine A & B

Virola calophylla Warb. "Epena," "Parica," "Yakee"
Myristicaceae
Colombia, Brazil
Rain forest
A tree to 20 m, dioecious; leaves leathery, oblong, 20–50 cm long, puberulent beneath; branches and inflorescence also puberulent; flowers in fascicles, small; fruit ellipsoid.
Hallucinogen
N,N-dimethyltryptamine and 5-methoxy-N,N-dimethyltryptamine

Withania somnifera (L.) Dunal "Ashwagandha," "Kuthmithi"
Solanaceae
South Africa, tropical Africa, India
Open places, disturbed areas, etc.
A much-branched shrub to 2.5 m tall; leaves elliptic to ovate-lanceolate, 6–9 cm long; flowers in axillary fascicles, small, green; fruit a red berry enclosed by the inflated calyx.
Sedative and tranquilizer
Somniferine

A Bibliography of Primary Sources

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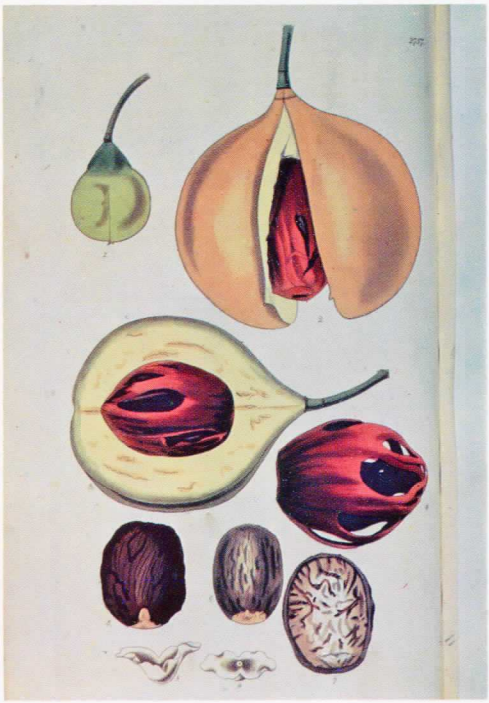

PLATE 17: *Myristica fragrans*

PLATE 18: *Mitragyna speciosa*

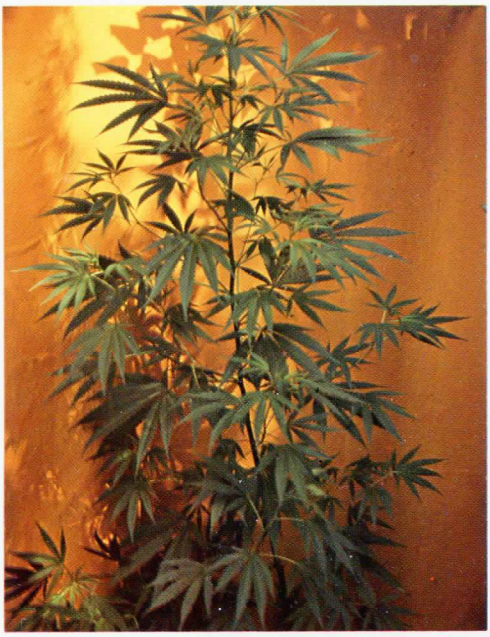

PLATE 19: *Cannabis sativa*

PLATE 20: *Cannabis* female flower

PLATE 21: *Cannabis* male

PLATE 22: *Amanita muscaria*

PLATE 23:
Ephedra trifurca

PLATE 24: *Sarcostemma brevistigma*

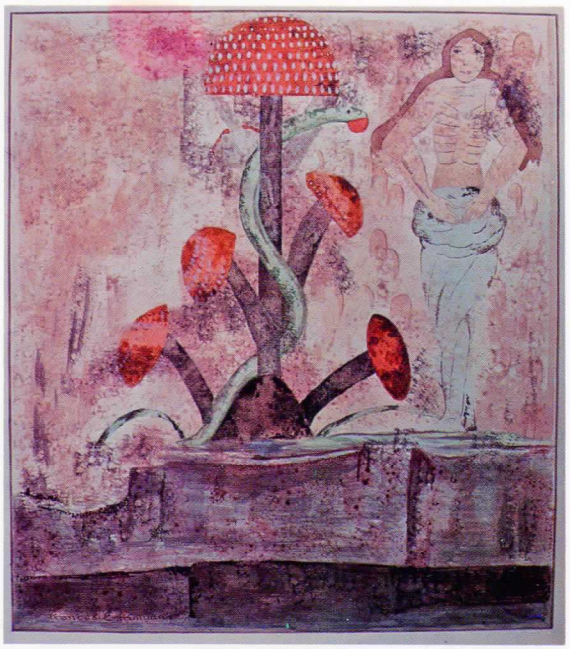

PLATE 25: *Amanita fresco*

PLATE 26: *Kaempferia galanga*

PLATE 27: *Boletus manicus*

PLATE 28: *Leonotis leonurus*

PLATE 29: *Foeniculum vulgare*

PLATE 30: *Catharanthus roseus*

PLATE 31: *Datura inoxia*

PLATE 32: *Mirabilis multiflora*

PLATE 33: *Heimia salicifolia*

PLATE 34: *Lophophora williamsii*

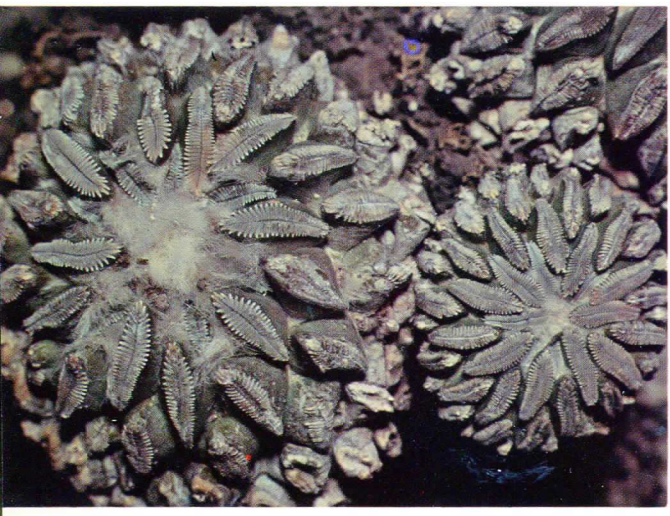

PLATE 35: *Pelecyphora aselliformis*

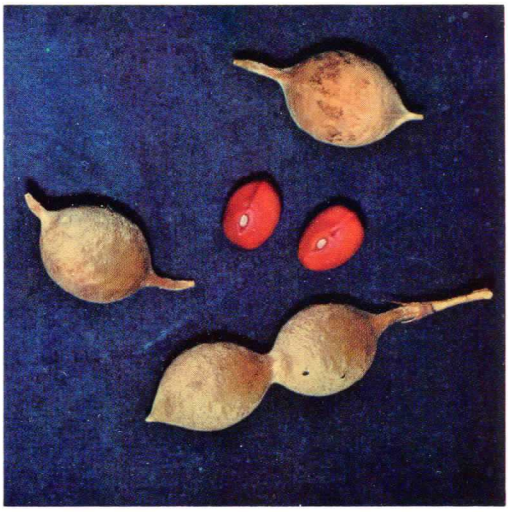

PLATE 36: *Sophora secundiflora*

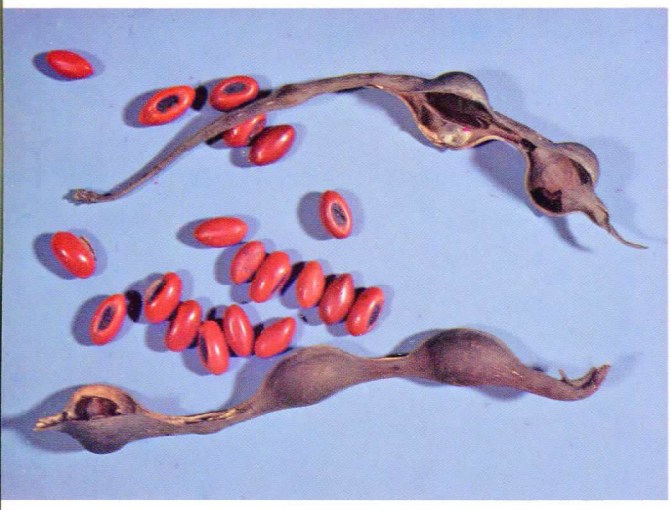

PLATE 37: *Erythrina* seed and fruit

PLATE 38: *Psilocybe cubensis*

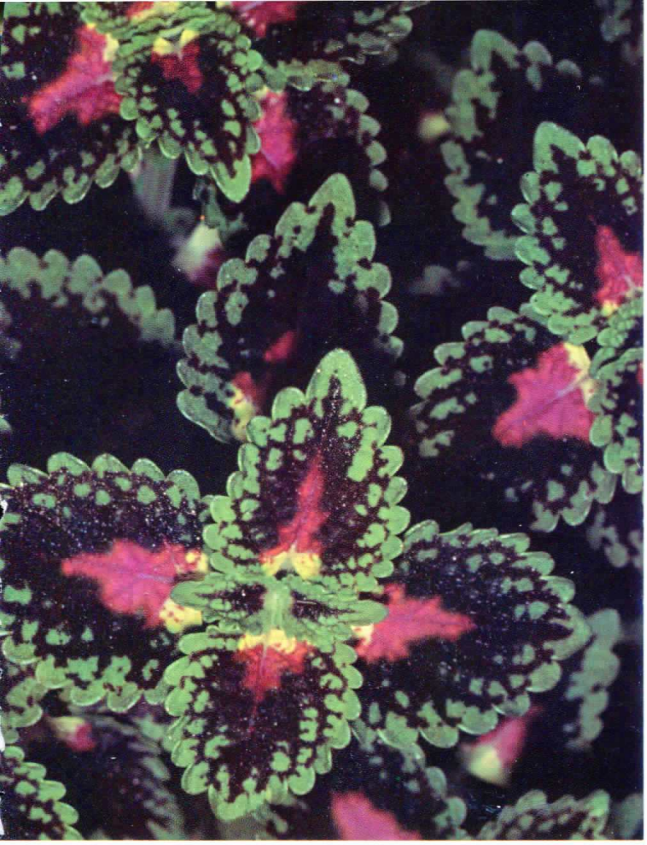

PLATE 39: *Coleus pumila*

PLATE 40: *Salvia divinorum*

PLATE 41:
Ipomoea violacea var. Heavenly Blue

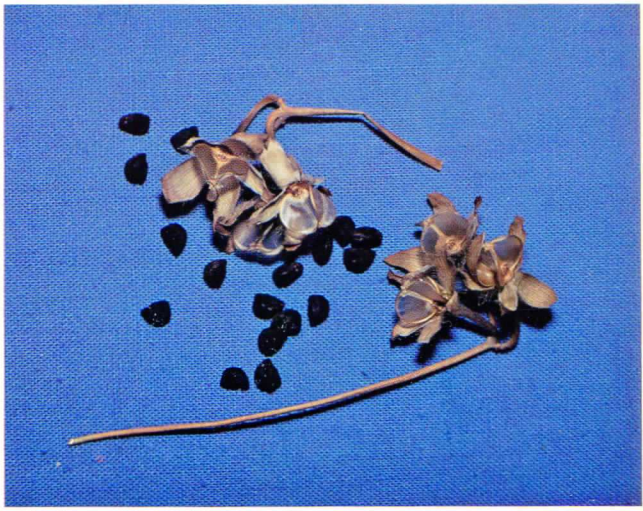

PLATE 42:
Ipomoea violacea seed and capsules

PLATE 43: *Argemone mexicana*

PLATE 44: *Tagetes lucida*

PLATE 45: *Banisteriopsis caapi*

PLATE 46: *Tetrapterys methystica*

PLATE 47:
Brunfelsia grandiflora

PLATE 48:
Methysticodendron amesianum

PLATE 49: *Iochroma fuchsioides*

PLATE 50: *Desfontainea spinosa*